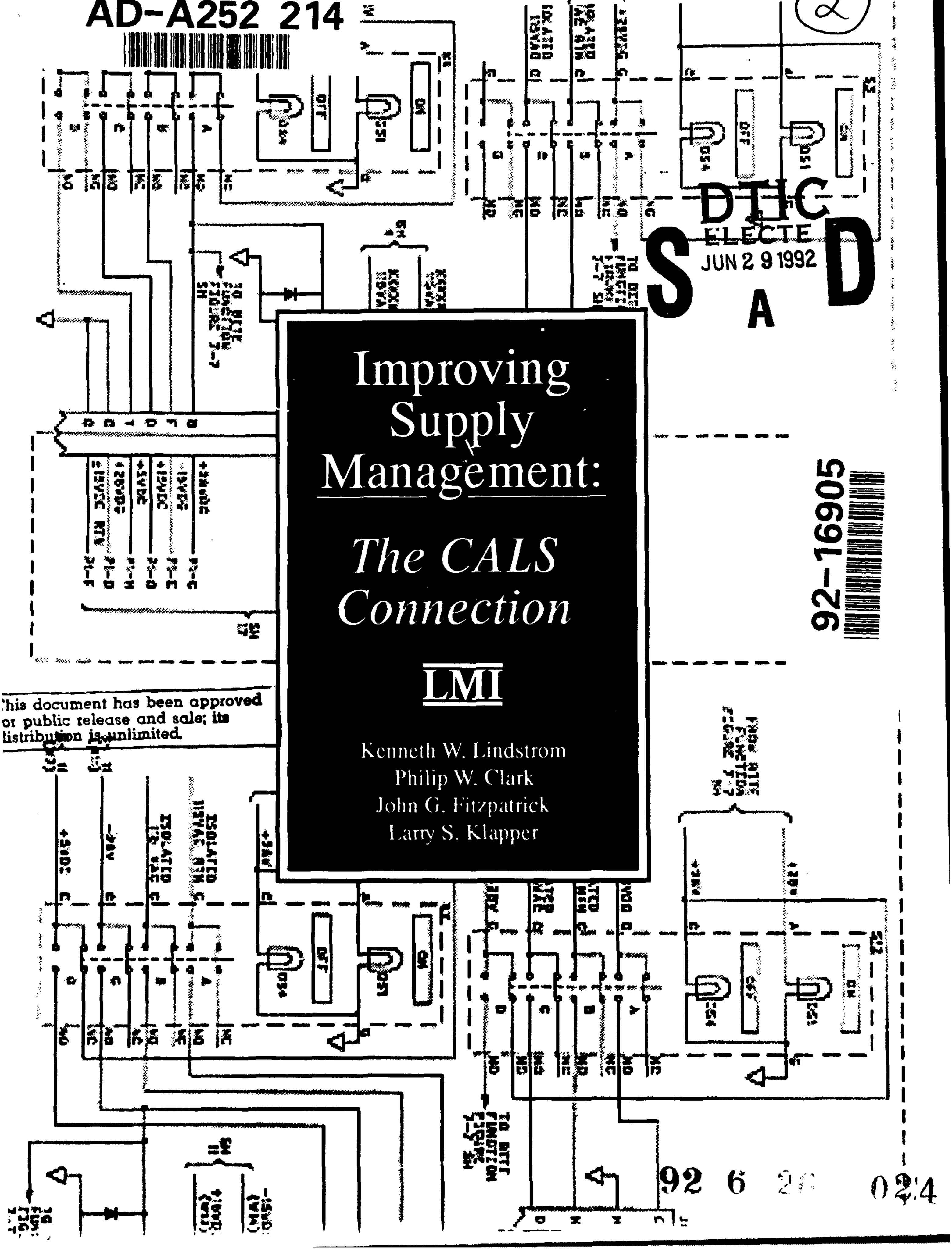

Improving Supply Management:

The CALS Connection

LMI

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The Computer-Aided Acquisition and Logistics Support (CALS) program provides data management concepts and interchange standards that promote information sharing in digital form. CALS concepts can improve supply management processes and reduce costs by eliminating data exchange problems and providing timely access to information. Today with sequential processes, data are passed along with the task from function to function. The CALS concept shares digital data in a common data base allowing many tasks to be performed concurrently. As a result, throughput times are improved and flexibility is added so that the process can be modified as new information, like a design change, becomes available.

This report examines the exchange of information between weapon system contractors and DoD when spare parts for new weapon systems are being provisioned and procured. The acquisition phase of weapon system support requires the transfer of information between a large number of contractors and DoD. The diversity of computer systems used by contractors and by Government activities has made information exchange extremely difficult to standardize. As a result, the introduction of CALS concepts can have its most dramatic impact during the acquisition phase of weapon system support.

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IMPROVING SUPPLY MANAGEMENT: THE CALS CONNECTION

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February 1992

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LMI

Executive Summary

IMPROVING SUPPLY MANAGEMENT: THE CALS CONNECTION

The Computer-Aided Acquisition and Logistics Support (CALS) program provides data management concepts and interchange standards that promote information sharing in digital form. CALS concepts can improve supply management processes and reduce costs by eliminating data exchange problems and providing timely access to information. By applying CALS concepts, many supply management processes now performed sequentially using batch processing could be performed concurrently. Today with sequential processes, data are passed along with the task from function to function. The CALS concept is to share digital data in a common data base allowing many tasks to be performed concurrently. As a result throughput times are improved and flexibility is added so that the process can be modified as new information, like a design change, becomes available.

This report examines the exchange of information between weapon system contractors and DoD when spare parts for new weapon systems are being provisioned and procured. The acquisition phase of weapon system support requires the transfers of information between a large number of contractors and DoD. The diversity of computer systems used by contractors and by Government activities has made information exchange extremely difficult to standardize. As a result, the introduction of CALS concepts can have its most dramatic impact during the acquisition phase of weapon system support.

To realize this potential, CALS concepts must be incorporated into the design of new supply management information systems. We recommend that the Assistant Secretary of Defense (Production and Logistics) take the following short-term actions:

- Direct the Joint Logistics Systems Center to incorporate CALS concepts like the Contractor Integrated Technical Information Service (CITIS), the

Product Definition Exchange using STEP[1]* (PDES), an Integrated Weapon System Data Base (IWSDB), and Concurrent Engineering (CE) in the Logistics Corporate Information Management (LCIM) migration strategy

- Direct supply management personnel to participate actively in the development of CALS initiatives to ensure that supply management functional requirements are considered in CALS development
- Request cooperation from the Under Secretary of Defense for Acquisition to resolve policy issues that may limit the usefulness of CALS. CALS will require a change in the DoD/contractor relationship because of the shared-data environment and uncertainty about data ownership rights.

We recommend that the Assistant Secretary of Defense (Production and Logistics) take the following long-term actions:

- Direct that generation of provisioning data be an integral part of the design process as part of the IWSDB and CE concepts
- Direct further research be made in use of product definition standards like PDES to replace or to supplement manually prepared item identification information currently used in the DoD cataloging system
- Ensure that supply management functional requirements are fully incorporated in the IWSDB design. Functional requirements include real-time Design Change Notice processing, provisioning performance feedback, access to contractor interim support data, automated inactive item processing, and automated interchangeability studies.

*STEP is an international product definition standard. The English translation of STEP is Standard for the Exchange of Product Model Data.

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CHAPTER 1

OVERVIEW

INTRODUCTION

This report examines how Computer-Aided Acquisition and Logistics Support (CALS) technology can be used to improve supply management. In the short term, CALS should be viewed as a technical tool, like electronic data interchange (EDI) or microcircuit technology, needed to make the necessary functional improvements to meet the Defense Management Review and the Inventory Reduction Plan goals. Today, CALS tools consist of data interchange standards and concepts to improve management of information. We examine how these tools can be applied to improve specific supply management functions and how these functions need to change to take advantage of CALS concepts for the exchange of digital information. In the long term, CALS will have the look and feel of a major new information management network which integrates all weapon system logistics information into a single logical data base. Given this vision, we evaluate longer term process improvements.

Our report focuses primarily on the acquisition phase of the weapon system life cycle, during which CALS will have its most dramatic effects. CALS will improve supply system access to and processing of both weapon system design and logistics information. Improving the acquisition phase of supply support is an important part of the DoD Inventory Reduction Plan that was initiated to meet the challenge of resizing Defense inventories while maintaining high levels of readiness. CALS technology will provide the means and opportunity to make the kind of fundamental process changes necessary to meet these Inventory Reduction Plan goals. Table 1-1 displays the Inventory Reduction Plan functional breakdown; functions covered in this report are shown in bold typeface. These "up front" processes have a profound effect on the quality, timeliness, and cost effectiveness of subsequent supply support activity.

TABLE 1-1

PORTION OF INVENTORY REDUCTION PLAN FUNCTIONS DISCUSSED IN THIS REPORT

Acquisition Materiel Management	Item Introduction	Requirements	Asset Management	Materiel Distribution
Provisioning	***Item Entry Control***	***Contract Termination***	***Just-In-Time Inventory***	***Total Asset Visibility***
Technical Data Acquisition	***Parts Control Program***	***Procurement Lead Time***	Direct Vendor Delivery	Materiel Returns
Item Proliferation Control	***Item Reduction***	***Weapon System Management***	Use of commercial Item and Distribution Systems	Physical Inventory Control and Security
Configuration Management	Compact Disk Technology	Repair Cycle Time		Shelf-Life Management
Phased Organic Support	Materiel Pricing	Order Quantity		Materiel Retention and Disposal
Readiness-Based Sparing	Competition and Breakout	Safety Levels		
Reliability and Demand Forecast Estimates		Retail Stockage		
Quality Measures		Non-Demand-Based Additives		
		Inventory Stratification		
		Spares Budget Automation		
		Diminishing Manufacturing Sources		
		Materiel Quality and Standardization		

Notes: Bold face – functions included in the study; light face – functions outside of the study.

MAJOR ISSUES

This report has two major objectives:

- To identify current CALS initiatives that have potential for improving the supply process
- To develop a strategy to apply CALS technology in new areas to improve supply management processes.

To accomplish these objectives, we address three major supply process improvement issues: the supply processes that can benefit from existing CALS technology, the improvements that can be realized in the near term using existing non-CALS technology, and the long-term improvements that will be possible when CALS has matured. In the near term, we found that specific CALS process changes

can significantly reduce provisioning and cataloging process times, reduce inventory levels, improve weapon systems support, and improve the overall quality of important supply decisions. In the long term, CALS can dramatically and fundamentally change the nature of all logistic support processes by fully integrating them with the design function. This would further reduce processing times and eliminate most of the labor involved in developing and processing logistics data.

We also address three significant management issues: control over CALS implementation, policy conflicts that need to be addressed, and the cultural changes needed to make large-scale improvements. We believe that the CALS capabilities and benefits have already been proved successfully in specific weapon system program prototypes and demonstrations: the time has come to begin to implement this technology throughout DoD. Effective implementation requires high-level, joint-service leadership, functional control, and close coordination with the Logistics Corporate Information Management (LCIM) effort.

IMPROVING THE SUPPLY PROCESS

Supply Processes That Can Benefit from CALS

In order to best determine how CALS tools and techniques could be used to improve the supply process, we prepared a model of the current supply system. We focused on acquisition planning, parts control, initial provisioning, and cataloging. We found these processes to be generally sequential. They could be made more flexible and responsive in the concurrent, streamlined, CALS environment.

Next, we evaluated the external factors that influence these supply processes. We found that the supply system will be expected to continue to provide high-quality support in an era of declining budgets and shrinking personnel resources. To do this will require an increase in productivity and a decrease in costs.

Lastly, we modified the current supply system process model to allow for more concurrent activity and other CALS-related process changes and compared the results to the baseline. We found that the process could be improved substantially. Our detailed comparison of the current and improved system is contained in Appendix C.

To test the feasibility of these changes and to gather additional ideas, we visited several major acquisition program managers who were including CALS

requirements in their contracts, their prime contractors, and the Service and Defense Logistics Agency (DLA) supply support activities involved in the acquisition process.

Sequential, Batch-Oriented Processes

The acquisition phase of the supply process has not undergone fundamental technological change in the last 20 years. It is predominantly transaction oriented and was originally designed for batch processing computer technology. The result is sequential processing in which data and tasks flow along a single path from one activity to the next. As each task is accomplished, data are created, modified and manipulated, then passed on to the next task.

For example, design data are passed from the contractor engineering section to the contractor provisioning section in the form of drawings. Provisioning prepares part listings from the drawings and passes the lists to Government provisioning and cataloging organizations. Cataloging prepares item descriptions and assigns national stock numbers (NSNs). The item manager calculates a spares requirement and passes the data to procurement. This sequential process, which has served the supply community well through the years, is capable of handling large volumes of information and is fairly easy to monitor and control. However, it has several drawbacks.

Because the tasks are sequential, the entire process takes a long time to complete. Each task is dependent upon data that were created in the previous task. For example, the preparation of parts lists cannot begin until the engineering department releases the design drawings. Entire functions can be held up waiting for the results of a previous step, and when the data arrives, they often come in large batches that do not allow enough time for processing and the actions necessary. Because provisioning takes so long the process is started earlier and earlier in the development phase. Although design stability is a prerequisite for provisioning, the pressure to provision early often overrides that requirement which causes a high rate of design change notices (DCNs). These DCNs then require more time, effort, and funds to process. In many cases, the spares procured before design change become obsolete.

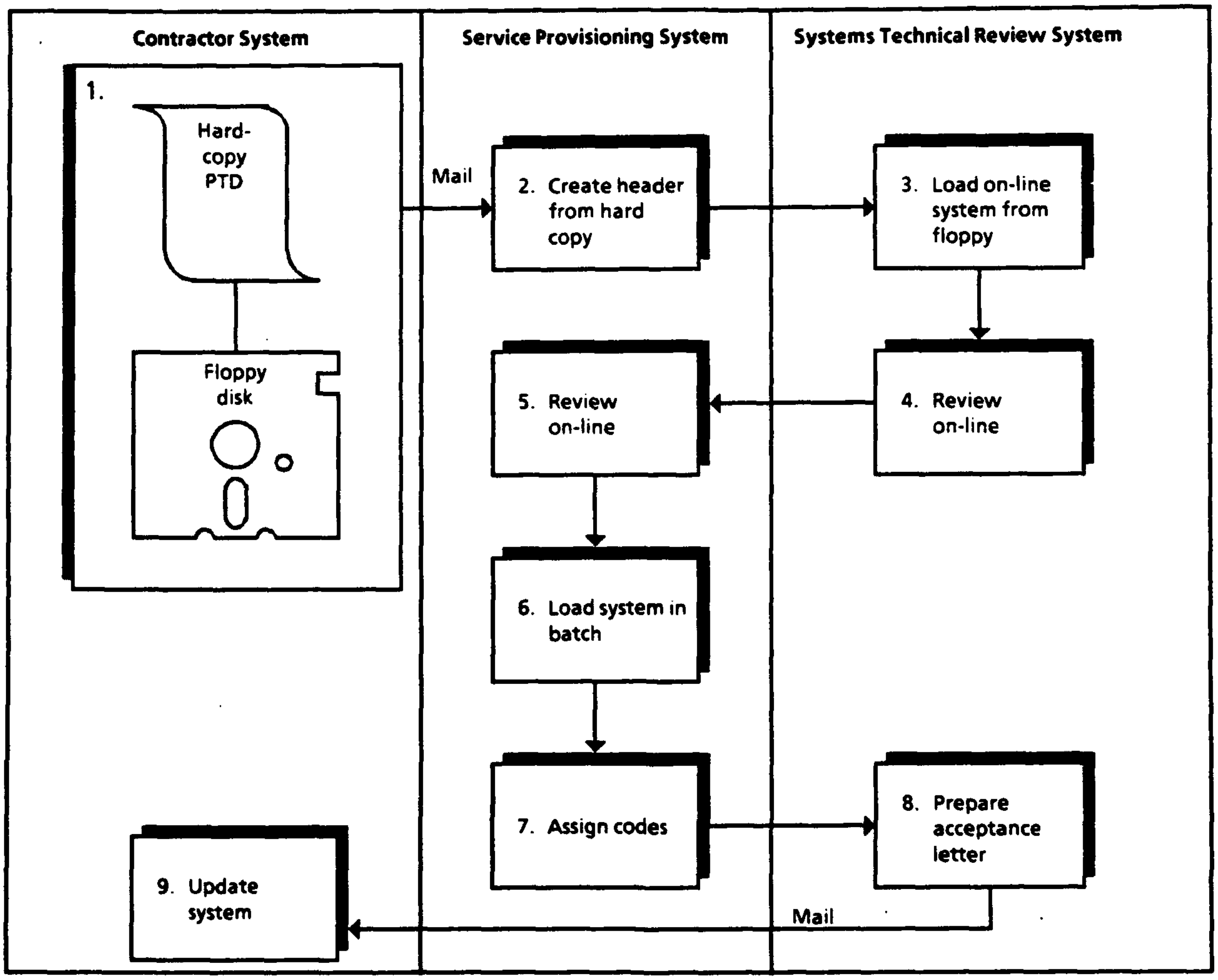
Also, once a task enters the process, it is difficult to respond to changes that take place downstream because change data must flow down the same path. While procurement is initiating action to buy a spare part, engineering could release a

modified drawing that deletes the part. As the DCN flows through the process, each decision must be examined, earlier actions rescinded, and new actions initiated.

The sequential process also makes it difficult to pass data from one activity to the next. In the acquisition phase, weapon system data must often be output on paper for delivery to the Government. Within the Government, considerable work is expended entering data from hard copy into the automated supply system. As data move from one supply function to another, they must often be output on hard copy and then manually keyed into the next system. Figure 1-1 shows a sample provisioning process used by a major program. In this case, the contractor's automated system produces both hard copy and floppy disk for submission to the Government. From the hard-copy provisioning package the Government manually inputs component identification information into its automated provisioning system and assigns processing responsibilities to specific provisioning personnel. The Government processes the contractor's floppy disk into a separate automated system for technical review, and later transfers the information in batches to the Inventory Control Point supply automated system for the procurement of initial assets. The net result is a lengthy and labor-intensive process.

Because it is difficult to pass data from one system to another, the various Government supply functions have become fairly autonomous and find it necessary to validate data which have already been validated elsewhere. Various supply management and maintenance codes may be thoroughly analyzed and reviewed by a contractor, then by Government maintenance personnel, and finally by Government supply personnel. Previous decisions can be changed, and then changed again, only to be changed back to the original by someone else. Examples of this kind are plentiful.

Basic to the CALS concept is the idea of sharing data. Data created and maintained by one activity are accessed and used by all activities that need it. Using this concept, many formerly sequential tasks could be performed simultaneously, which can revolutionize the supply management process. Instead of data moving from one process to the next, the most current data can be instantly accessed as they are needed. Figure 1-2 contrasts the differences between sequential and concurrent processing in generic form.



Note: PTD = Provisioning Technical Documentation.

FIG. 1-1. SAMPLE PROVISIONING PROCESS

In this concurrent data environment, incremental, or phased provisioning can be fully implemented. Procurement of design-stable components could begin immediately as could procurement for those items selected as Spares Acquisition Integrated with Production (SAIP). For the others, all actions up to the point of spares procurement could be completed early; procurement could be suspended until a lead time away from the date needed. Delaying procurement would reduce the probability that DCNs will negate procurement. Procurement of components for segments of the design that are not stable could be deferred, thus avoiding buying spares that will never be used and making unnecessary design changes. Using this

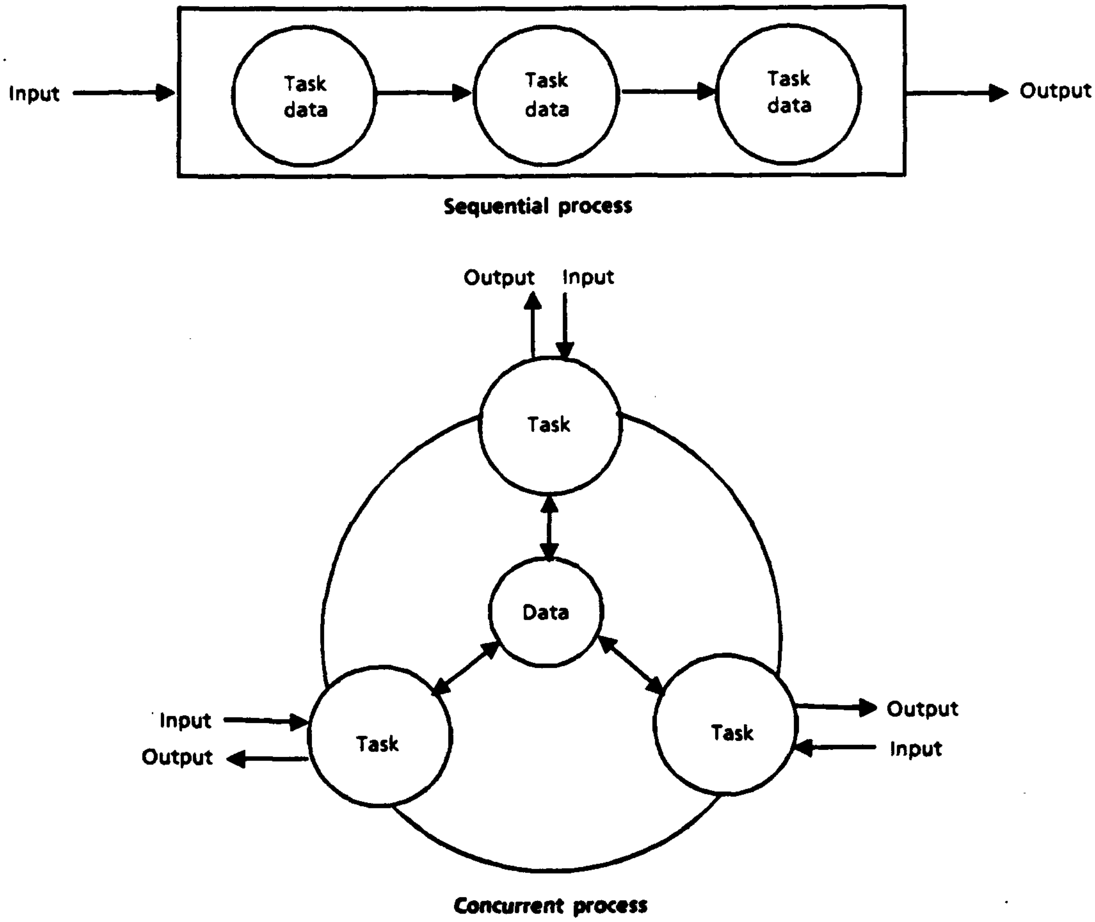


FIG. 1-2. CONCURRENT VS. SEQUENTIAL PROCESS

concurrent approach, earlier organic support could be achieved for many items, and needless procurements could be avoided for unstable items.

Improving Productivity and Reducing Costs

Any supply system is ultimately judged by its ability to provide support to combat forces. That support is measured in terms of the readiness and sustainability of both people and equipment. The existing supply system has been developed to support global war with the Soviets that could begin with little notice, as a result the supply system must be maintained in a constant high state of readiness. The recent political changes in the Soviet bloc have reduced the threat of global war. This reduced threat and our huge budget deficit have lead Congress to reduce defense spending.

Declining budgets will lead to a DoD "build-down." Force structures will be streamlined and the supply system will be challenged to maintain peacetime readiness and wartime sustainability with fewer human and fiscal resources. In future crises, the supply system may have to be even more responsive and flexible than previously required in order to gear up for major operations.

Tools are needed that can allow the supply system to maintain its level of support to combat forces in the face of changing missions and rapidly declining budgets.

A Role for Computer-Aided Logistics Support

CALS, EDI, Decision Support Systems (DSS), artificial intelligence (AI), and various telecommunications developments are being exploited to give DoD the tools to build a more timely, flexible, and responsive support system with diminishing resources. Private industry has set an example by using similar tools to streamline business processes and to increase corporate responsiveness in order to remain competitive. Industry has proved that these techniques work and now Services and DLA are beginning to apply similar methods.

Near-Term Improvements Using Available CALS Technology

Next, we analyzed the various CALS tools and techniques that are available today and will likely be available tomorrow. Based upon our analysis (Appendix C) and our field research, we concluded that CALS can be used immediately:

- *CALS can significantly reduce the time that it takes to provision new and modified weapon systems.* Today's process is sequential, generally driven by large batches of information, and relatively slow. CALS can complete tasks faster than they are performed today and can also eliminate some tasks altogether. By developing tools that monitor design stability, CALS makes phased provisioning more feasible. Parts for components with stabilized designs can be processed in small batches early in the program rather than waiting for the entire weapon system design to be completed. Organic support could be achieved for these components earlier, thus avoiding the need for interim contractor support arrangements. Provisioning of other components can be deferred until stability has been achieved, possibly under some form of interim contractor support arrangement. This would decrease the cost, time, and excess inventories caused by design changes. By developing and implementing software that monitors logistics data as they are created – such as the DLA prototype Data Review, Analysis, and Monitoring Aid (DRAMA) – the time and labor needed for supply support

requests (SSRs) and design change notices (DCNs) can be reduced. Further cost and time reductions can be achieved by delivering and processing provisioning-related technical data in digital format. By implementing on-line access and review procedures, as demonstrated in the B-2 Logistics Support Management Information System (LSMIS), developed by Northrop Corporation for the Air Force, the provisioning coding conference can be eliminated. Additional time can be saved by transferring item identification responsibilities to contractors and providing them with Government-furnished cataloging expert systems. Figure C-1, illustrates the cumulative impact of these improvements. After implementation of the near-term improvements, referred to as mid-term CALS in Figure C-1, weapon system developers can achieve material support date 20 months sooner. Reducing the time to reach the material support milestone is vital to anticipate the shorter development time predicted for future weapon systems.

- *CALS can reduce costs by helping to reduce inventory levels.* Today's system does not provide the contractor with essential tools needed to make good parts selection decisions. By giving the design engineer better parts control and standardization tools, including real time access to Government systems such as DLA Modernized Parts Control Automated Support System (MPCASS) and the Logistics Remote User Network (LOGRUN) he can reduce the number of new items entering the system. CALS can provide better auditing capabilities and permit delegation of approval authority to contractors for support data generated at the contractor's site. Expanding the number of part number references in the defense catalog through better access to vendor data bases will make further item reductions possible. The development and use of better reliability prediction tools and provisioning performance feedback systems can lead to more accurate initial stocking decisions. Additionally, investment in inventory levels can be lowered by the kinds of reduction in administrative and production lead times made possible through computer-aided design (CAD) and computer-aided manufacturing (CAM) technology, such as the rapid access to manufacturing parts (RAMP) prototype.

- *CALS can allow DoD to maintain support levels and improve quality in spite of resource cuts.* The existing supply process is manually intensive and requires a great deal of experience and understanding in order for a user to become proficient. Expert systems, such as the Army's Logistics Planning and Requirements System (LOGPARS), can improve the knowledge and understanding level of Government personnel responsible for planning logistics requirements. Similar AI applications can be developed to assist logistics personnel in identifying a wide range of potential problems without having to manually review each and every data deliverable. Productivity improvement tools, such as DLA's prototype Cataloging Tools On-Line (CTOL), have the potential to dramatically increase throughput while using

less personnel than previously required. Tools like these can help make job consolidation feasible.

Long-Term Improvements from CALS

We believe that in the long term, because of initiatives like Concurrent Engineering (CE), Product Data Exchange Standard using STEP[1] (PDES), and the Integrated Weapon System Data Base (IWSDB), described in detail in Appendix A, CALS can improve the supply process even more dramatically. In the future, CALS can make three major contributions:

- *Absorb all logistics functions into the design process.* Today, design engineering, production engineering, and logistics engineering (including provisioning) are generally treated as separate functions. Once the components have been designed, the designers hand off all the data to the producers and supporters. After this stage it is difficult to change the design or to make it more producible or supportable. Also, the logistics data must be manually extracted from the engineering drawings and loaded into separate data systems. It has been the goal of the logistics community, and the logistics support analysis process in particular, to build maintainability and supportability into the initial design of weapon systems. CALS can provide the CE team with the tools that could allow logistics considerations, such as life-cycle cost and piece-part standardization, to be built into the design process. Logistics products, such as spares listings and procurement drawings, could simply be generated in digital form from the integrated CAD/CAM and other CALS systems.

- *Extract all item identification information from digital product descriptions.* Today, Government cataloging personnel must prepare item descriptions by manually extracting relevant descriptive information from a drawing, catalog page, sketch, or other technical data provided by the contractor. As digital product descriptions, like PDES become available, the information needed for item descriptions will be digitally encoded. An item identification could be extracted directly from a PDES digital product description, or conceivably the PDES code itself could be recorded in the Federal catalog. Product descriptions in digital form can reduce or even eliminate item description workloads.

- *Eliminate the routine batch transfer of supply-related data from contractor to Government and from one Government agency to another.* Today's process, still largely dependent on moving pieces of information, either hard copy or magnetic media, from one point to the next, is slow, subject to changes along the way, and requires redundant storage and maintenance. The IWSDB

[1]STEP is an international product definition standard. The English translation of STEP is Standard for the Exchange of Product Model Data.

conceptual design integrates the Logistics Support Analysis Record (LSAR) with PDES thus combining all the logistics information known about a weapon system which is all the data currently delivered by the contractor to the Government. Once the IWSDB concept has been implemented, logistics data can be accessed instantly regardless of physical locations. The creator of the data also stores and maintains the data; however, each user with a need can access the data through a CALS telecommunications network. To the user, it's as if the data were physically stored at the user's facility. The IWSDB eliminates the need to physically transfer data from one activity to the next and eliminates the problem of trying to keep multiple data files consistent. With this type of data integration in place, SSRs and DCNs can be eliminated as separate transactions. Also, the procedural differences between organic support and contractor support can be eliminated once a common logical data base exists.

MANAGING THE IMPLEMENTATION

Supply Functional Involvement

The CALS community has developed data interchange standards which allow text and graphics data to be passed from one system to another regardless of the type of hardware or software being used. Now that data can be interchanged between systems, we described how that data should best be used and how the procurement processes should change. Of course, to take advantage of improvements made possible by CALS, the supply community must use CALS. To be effective, supply executives must participate first hand in technology initiatives, such as CE, PDES, Contractor Integrated Technical Information Service (CITIS), which are outside of the immediate domain of supply management.

Centralized Control and Standardization

CALS program management must become more centralized as the CALS supply program moves from prototype to broad implementation and as data integration replaces data interchange. With each Service and DLA pursuing CALS projects, there is a risk of duplication of effort and further departure from a standardized operating environment. Through Joint-Service coordination, the Services and DLA could better standardize products, coordinate projects, and share expertise.

Selected standardization of supply systems and procedures would also ease the transition to the IWSDB. Developing CALS prototypes for individual weapon systems has created unique systems which are not transportable to the supply system

in general. Standardization of core weapon system logistics data elements and systems is necessary to provide data base integration and would be the most effective way to implement the CALS long-term objective.

At the same time that CALS is moving toward implementing system and process changes, the LCIM effort is planning to standardize software and systems across DoD. Because of this, CALS supply initiatives should be closely coordinated with those LCIM efforts.

Policy Conflicts

Before CALS implementation can begin in earnest, a number of policy issues must be resolved, one of the most important of which is the contractual relationship. Today's procurement system stresses full and open competition, which means that relations between the Government and contractors are expected to be much more formal than between two private companies. Through data base integration, CALS will require that the Government work much more closely with its contractors. The present process of data delivery, acceptance, and payment needs to be re-evaluated. CALS/CE fosters teamwork: Government and contractor personnel must work more as a team, each contributing to the common goal, even when they are geographically dispersed. Data base management contracts with the major prime contractors on a life-cycle basis may be needed to reach the long-term CALS goals. The decision on whether to ease existing restrictions on sole source, long-term contracts must be addressed early. A more detailed discussion of policies affected by the CALS initiative can be found in Appendix D.

Cultural Change

Most functional managers at the inventory control points (ICPs) have a limited knowledge of CALS. Many have not heard about it at all, and some have a fairly simplistic view of it (usually it means "I get a floppy disk instead of hard copy"). Only a few have thought through the implications and opportunities which CALS technology can offer. Functional managers at the Service logistics commands and Service and DLA ICPs need to learn about the potential benefits of CALS in setting system modification and development priorities.

Recommendations

We recommend that the Assistant Secretary of Defense for Production and Logistics [ASD(P&L)] take the following short-term steps to improve the supply support process. These recommendations, if followed, can be used very effectively as starting points for the application of CALS technology in supply management.

- Modify the LSAR to track design stability to facilitate the use of phased provisioning.
- Improve provisioning by using software tools like the DRAMA system. (These and other short-term actions are discussed in Chapter 2.)
- Direct the Joint Logistics Systems Center to develop a transition plan and schedule to incorporate CALS functional requirements in the LCIM migration strategy. (A draft is included in Appendix F.)
- Task the CALS Evaluation and Integration Office to work closely with the ASD(P&L) Logistics Systems Development Directorate and other system consolidation/ standardization efforts to ensure that CALS-related supply improvements are considered. Specifically, they should promote Service standardization, reduce the duplication of effort being expended on developing CALS systems, and develop CALS training/indoctrination programs for the supply community. These recommendations are discussed in more detail in Chapter 3.
- Direct the testing of CALS-related process changes that have the potential for decreasing costs and labor and increasing the quality of supply products. The submission and processing of Supplemental Provisioning Technical Documentation (SPTD) in digital format, contractor preparation of item identification data using DLA's CTOL, and contractor assumption of additional parts control responsibilities made possible by on-line access to DLA data bases and systems are examples that are further discussed in Chapter 2.
- Request cooperation from the Under Secretary of Defense for Acquisition to resolve policy issues that may limit the usefulness of CALS. Issues regarding the changing contractual relationships between contractors and DoD in a shared-data environment, data ownership rights, and others must be addressed. Appendix D contains a more detailed discussion.
- Appoint OSD supply functional personnel to participate in DoD CALS-sponsored Government/industry technology initiatives (e.g., CE, PDES, CITIS, and IWSDB) to ensure that supply requirements are adequately addressed.

We also recommend that the ASD(P&L) take the following long-term actions to support CALS:

- Establish a long-range goal for the LCIM to incorporate the generation of provisioning data into the normal weapon system design process. The architects of the IWSDB and the proponents of CE can ensure that provisioning data are captured and recorded as a by-product of hardware design.
- Establish a long-range goal for the LCIM to eliminate manual item identification. The PDES electronic representation of parts, components, and systems can ultimately be used to extract the data necessary for cataloging, or PDES product descriptions could possibly eliminate the need to store this information in separate cataloging files.
- Ensure that supply functional requirements are fully incorporated into the IWSDB design. As data integration replaces the need to digitally exchange data in a standard format, CALS emerges as an extremely large and complex system of interacting data bases and software applications. It is critical that functional requirements govern IWSDB design if the resulting system is to yield real improvement. Examples of supply functional requirements that should be considered are real-time DCN processing, provisioning performance feedback, access to interim contractor support data, automated item reduction and inactive item processing, and other potential improvements discussed in Chapter 2.

REPORT CONTENTS

Chapter 2 presents major findings, conclusions, and recommendations to improve the supply process. Chapter 3 does the same for managing the implementation of CALS process changes. Appendix A provides the history of CALS evolution and additional background material. Appendix B is a complete work breakdown structure of the logistics tasks required for procurement of a major weapon system and was used to identify areas where CALS initiatives can improve the process. Appendix C is a weapon system acquisition process model of these logistics tasks that explores potential CALS short- and long-term process improvements. Appendix D contains some general and specific recommendations for changes in policy to encourage CALS implementation. Appendix E lists each of the CALS projects that we reviewed along with a brief discussion. Appendix F is our recommended transition plan that assigns specific actions and responsibilities for implementing short-, mid-, and long-term changes.

CHAPTER 2

USING CALS TO IMPROVE THE SUPPLY PROCESS

INTRODUCTION

In order to identify potential improvements in the CALS supply process, we first analyzed the current process used to introduce new weapon system parts into the supply system. We examined four functional areas to determine how the tasks within each function affected the other tasks on the path to achieving Initial Operational Capability (IOC) and Material Support Date (MSD). These are the four functional areas:

- *Procurement.* The tasks necessary to manage major acquisition programs
- *Engineering.* All tasks required to design, test, and produce a major weapon system, including configuration control
- *Parts control.* The tasks required for assembly, subassembly, and piece-part standardization
- *Provisioning.* The tasks required to identify, procure, and manage spare parts to support a new or modified weapon system, including cataloging functions.

Figure 2-1 presents a graphical display of each task in the acquisition process. Traditional weapon system acquisition phases are represented from left to right, beginning with demonstration and validation and ending with post production. Each process block is assigned a work breakdown structure code (see Appendix B for a detailed description of each function) and shows which organization is most responsible: contractor, program manager, Service ICP, or DLA. We also examined several inventory control processes that occur after the introduction phase. These "down stream" processes are not included in Figure 2-1.

After we defined the current process, we examined how CALS tools and techniques could be used to improve the process. We created a model of the current weapon system provisioning process schedule and focused our attention on those sequential actions that rely on data availability. Concurrently, we gathered

information through a literature search about existing CALS projects and initiatives that related to this process.

Next, we modified the model to allow for more concurrent activity and other CALS-related process changes and compared the results to the baseline. This analysis led to our process improvement conclusions and recommendations. A detailed discussion of this analysis is contained in Appendix C. In this chapter, we discuss our key findings, conclusions, and recommendations that relate to improving the current process.

FINDINGS AND CONCLUSIONS

Acquisition Planning

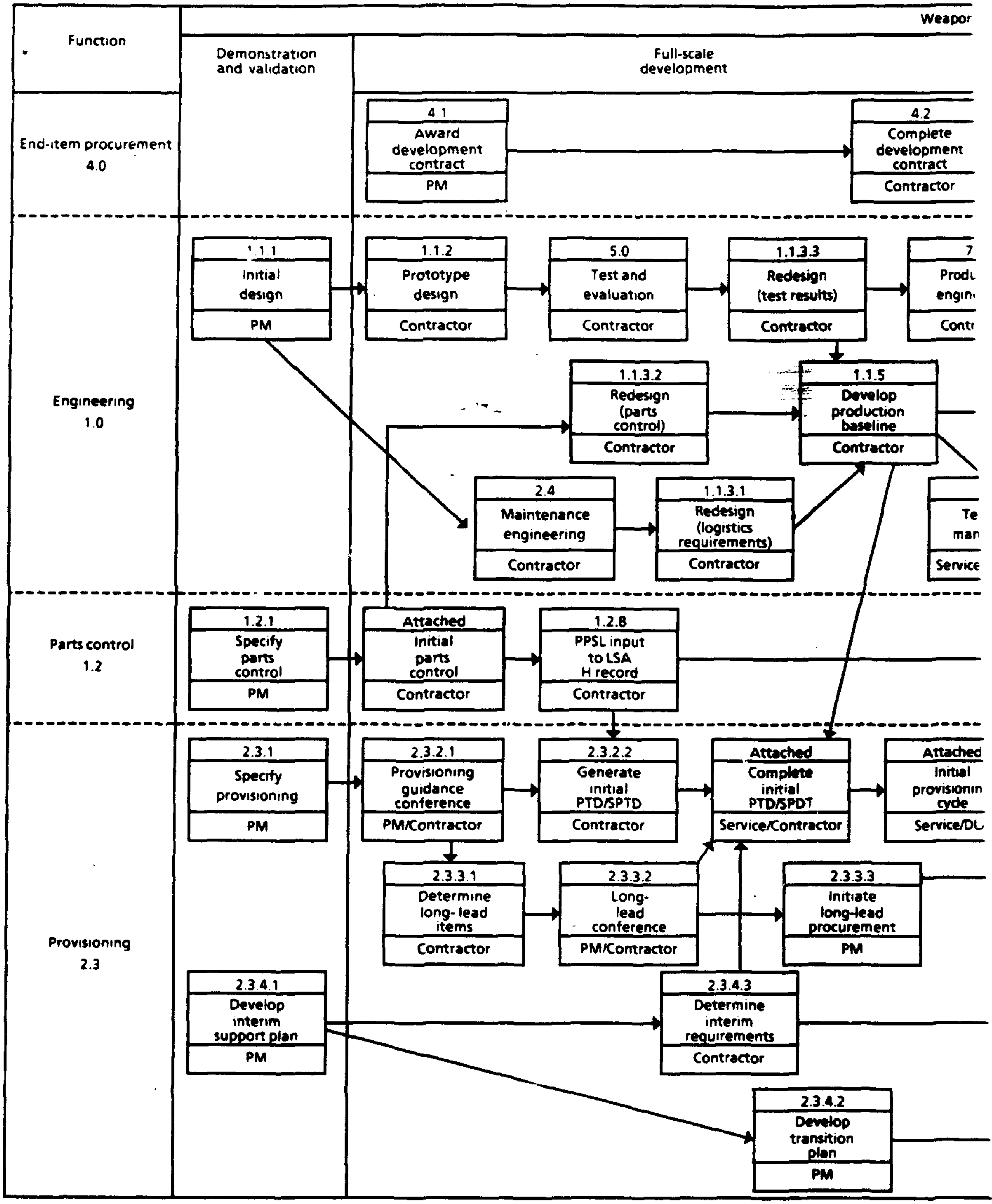
Tailoring Logistics Requirements

Tailoring Logistics Support Analysis (LSA) and other logistics procurement requirements to meet the specific needs of a weapon system program is a difficult process. A past study by CACI indicates that there is a general lack of understanding of the LSA process by inexperienced Government personnel who prepare logistics contract data requirements lists (CDRLs) for inclusion in contracts.[1] Over-specification of CDRL requirements can be extremely costly and wasteful, while specification can adversely affect weapon system support.

During our research, we found examples of both types. In many instances, the CDRL and data item descriptions (DIDs) selected for an acquisition had simply been copied from a previous procurement package without any real understanding of what was being bought or how it was to be used.

The use of expert systems, such as the Army's LOGPARS, can greatly improve the quality of contract preparation and LSA tailoring. LOGPARS helps program managers plan the logistics requirements for a specific program. LOGPARS can tailor the LSA logistics CDRL items for specific acquisition programs. This expert system should be shared with the other Services.

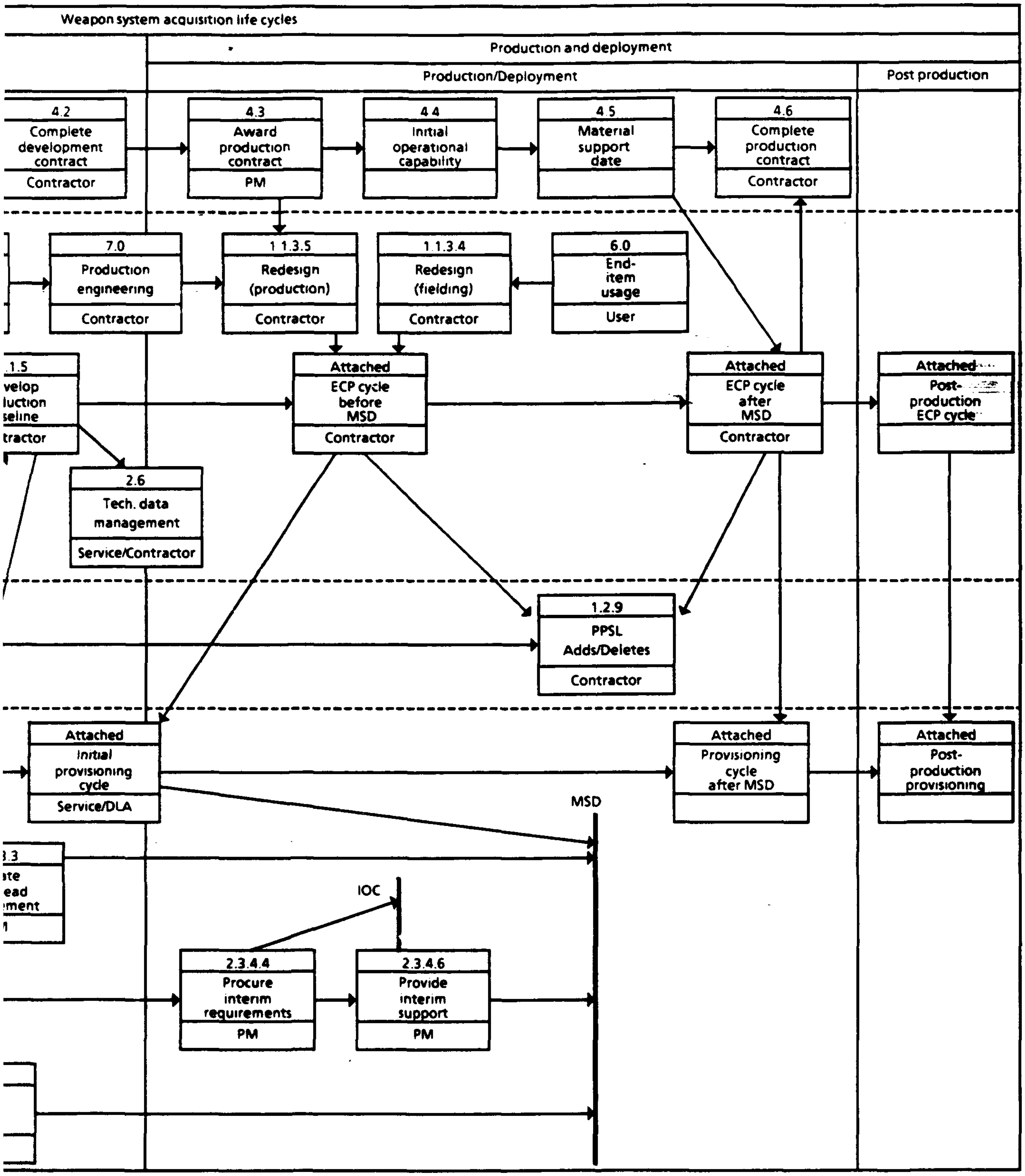
[1]CACI, *Cost-Effective Application of the LSA*, March 1987.



Notes: PM = program manager
LSA = logistics support analysis
PTD = provisioning technical documentation
SPTD = supplemental provisioning technical documentation
DLA = Defense Logistics Agency
ECP = engineering change proposals
MSD = r
IOC = in
PPSL = F

FIG. 2-1. INTRODUCTION OF NEW PARTS INTO THI

(1)



MSD = material support date
IOC = initial operational capability
PPSL = Program Parts Selection List

PARTS INTO THE SUPPLY SYSTEM – CURRENT PROCESS

Logistics Data Delivery

Many complex and interdependent tasks must be completed during weapon system acquisition in order to achieve organic (in-house) logistics support on schedule. Logistics data must be delivered just in time for performance of these tasks in order to avoid delaying task completion or using obsolete data. Tracking progress on multiple tasks and many deliverables can be difficult. Proper timing of data deliverables is further complicated by existence of separate schedules for hardware deliverables and data deliverables. The two schedules are usually coordinated when the program begins, with data scheduled to be delivered just before task execution. As the program evolves, however, hardware delays often occur because of funding delays or technical difficulties. Data delivery schedules often are not changed, however, resulting in data delivery well in advance of the task for which they are required.[2] When the hardware is finally delivered, data must either be revised and redelivered at additional cost, or the original data are used at the risk of being obsolete or incorrect. Logistics data delivery schedules must be adjusted along with other changes in program schedule if high-quality logistics support is to be provided within programmed costs.

The integration of engineering data bases and logistics data bases that CALS envisions in the long term eliminates the issue of data delivery. Logistics engineers have access to the design engineering and production engineering data as they are prepared. The concurrent development of design, production, and logistics can reduce the time needed to field a weapon system, but the program must be managed to prevent conflicting data delivery schedules.

Engineering

Engineering Change Proposals and Concurrent Engineering

Engineering change proposals (ECPs) are required to make changes in design after the production baseline has been established. ECPs are submitted to correct performance deficiencies or for manufacturing and logistics considerations. The cost of ECPs escalates rapidly as the weapon system moves into production because

[2]Questionnaire responses enclosed with Aerospace Industry Association (AIA) letter to John A. Mittino, Deputy Assistant Secretary of Defense (Logistics), 18 July 1989.

production design changes cause changes to tooling, provisioning, and documentation not affected during the early development phase.

Usually, design-related production and supportability problems are not identified until after the design is nearly complete.[3] As an example, an ECP may be proposed to improve supportability. If not approved, the supply system might be required to expend unnecessary resources to provide adequate supportability to the weapon system, the weapon system would suffer from reduced availability, or some combination of the two. An approved ECP becomes a DCN that is submitted to the supply system to initiate appropriate provisioning reviews of the new design. The same ECP process occurs in response to performance or production difficulties. The ECPs/DCNs for a major acquisition program can create more provisioning line-item changes than there were line items in the original submission.

Each of the Service ICPs that we visited identified ECP activity and design flux as one of their greatest challenges. A sample of 12 completed contracts showed a 225 percent change to provisioned line items. This means there were more than twice as many changes processed as there were line items originally provisioned.[4] The level of this activity has a tremendous effect on the ability of the supply system to efficiently establish organic support capability on time.

Concurrent engineering improves on traditional development methods by using teams of design, production, and logistics engineers who work in parallel from the beginning of system development. CE fields a higher quality, lower cost weapon system more quickly by designing production and logistics considerations into the original design rather than trying to modify the design after the prototype has been completed. Initial trials of CE for production of commercial and defense systems produced fewer design changes, less turmoil in provisioning, faster achievement of IOC, and lower logistics support costs. Traditional provisioning processes will benefit from the reduction in DCN changes. However, to take full advantage of CE techniques and to meet the reduced time to achieve IOC, contractor and Government provisioning processes need to be changed to develop support requirements, in parallel with design engineering, as information becomes available. The slow

[3] *Design Guidance for Producibility*, Military Handbook 727.

[4] Joseph W. Burns, "Design Change Notices (DCN) in Air Force Spares Acquisition," (unpublished thesis), September 1989.

production start-up, typical of the traditional engineering process, will no longer exist to provide the time to take provision actions after production begins.

Figure 2-2 shows the kinds of information and applications that could be available under the contractor CE concept with a shared data base.

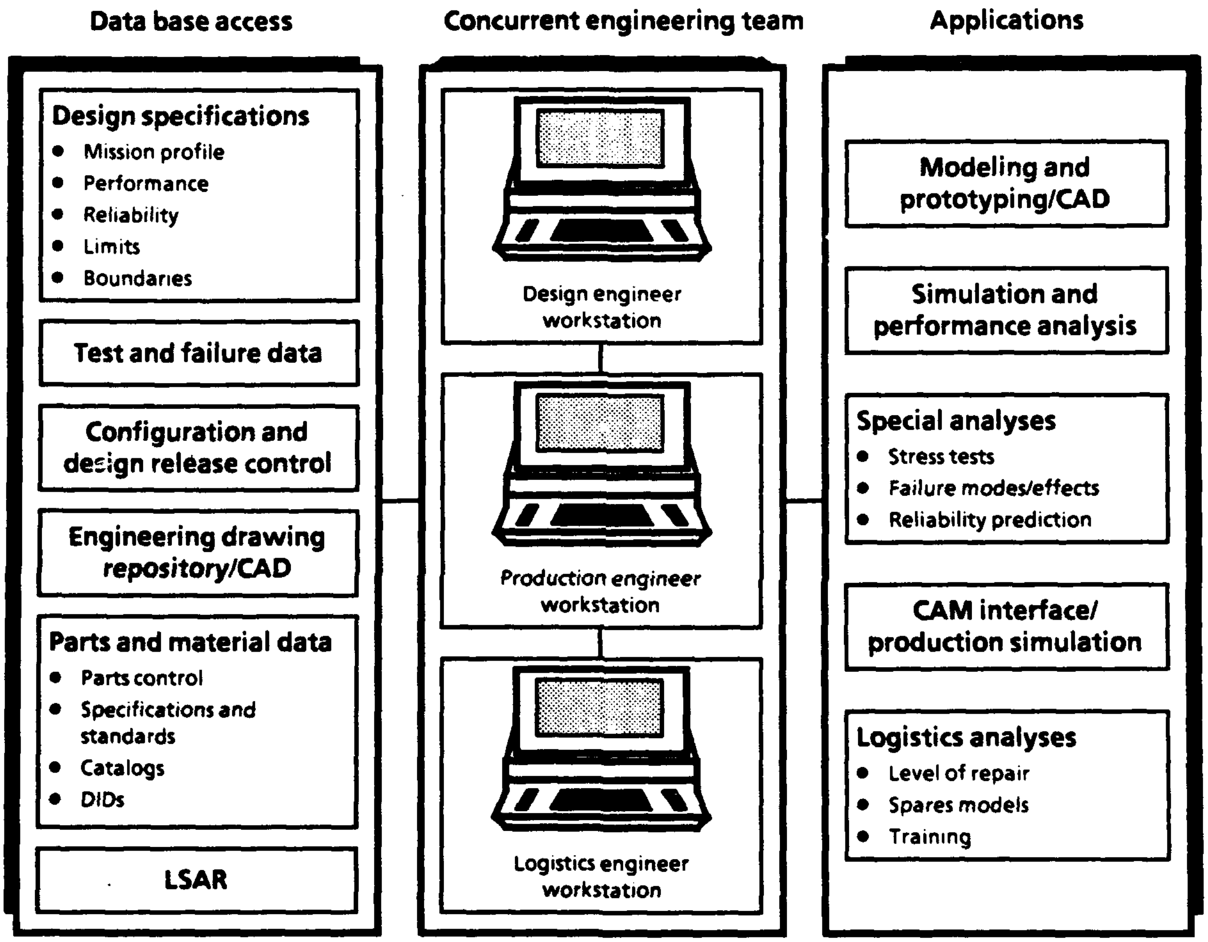


FIG. 2-2. CONCURRENT ENGINEERING DESIGN ENGINEERING AND SUPPLY SUPPORT

Concurrent Engineering and the Integrated Weapon System Data Base

The long-term goal of CALS is to integrate all weapon-system-related logistics information into a single, logical data base that can be accessed by all users who need the information. Under this concept, the physical location of the data is transparent

to the user. The heart of the IWSDB is the existing LSAR linked to, or combined with, a CAD representation of the hardware. PDES[5], a product description standard currently under development as a joint industry/Government activity, may be used to bridge the gap between logistics data and CAD data. This standard defines a product data model that joins design, production, and logistics data into a single electronic description of an item. In order for the CE team to function optimally, this kind of data base access will be necessary.

The IWSDB concept offers unparalleled benefits to the supply community. Figure 2-3 shows our conceptual model of the IWSDB that would be needed to support the types of improvements that will be required. Each of the large boxes in the figure represents distributed data bases maintained by the function responsible for the creation of the data. These data bases are linked through on-line, data base inquiries. Other information flows between the data bases as batch transfers or transactions. Batch transfers or transactions are used to move large amounts of data that would be inefficient to obtain by on-line inquiry or when it is necessary to maintain a transaction document structure, e.g., placing an order under an existing contract. Each connecting line in the diagram is labeled with the type of standard that might be used to transfer data, i.e., Modernization of Defense Logistics Standard Systems (MODELS), EDI, or CALS.

Table 2-1 lists examples of the kinds of weapon system and integrated material management data files that could be integrated along with the logistics functions supported by these files. The data bases column shows existing logistics data bases and their potential to be included in the IWSDB or to remain in "OTHER" data bases. The two remaining columns show the functions that create or access the data bases.

Parts Control

Characteristics Search

Using existing parts for new weapon system design reduces costs. Past research has shown that the use of standard piece parts in new designs saves $500 to $2,000 per part in initial documentation costs. An additional $4,500 to $25,000 cost to qualify new vendors to manufacture the part competitively may also be avoided. To maintain a single item in inventory has been estimated to cost approximately

[5]STEP is an international product definition standard. The English translation of STEP is Standard for the Exchange of Product Model Data.

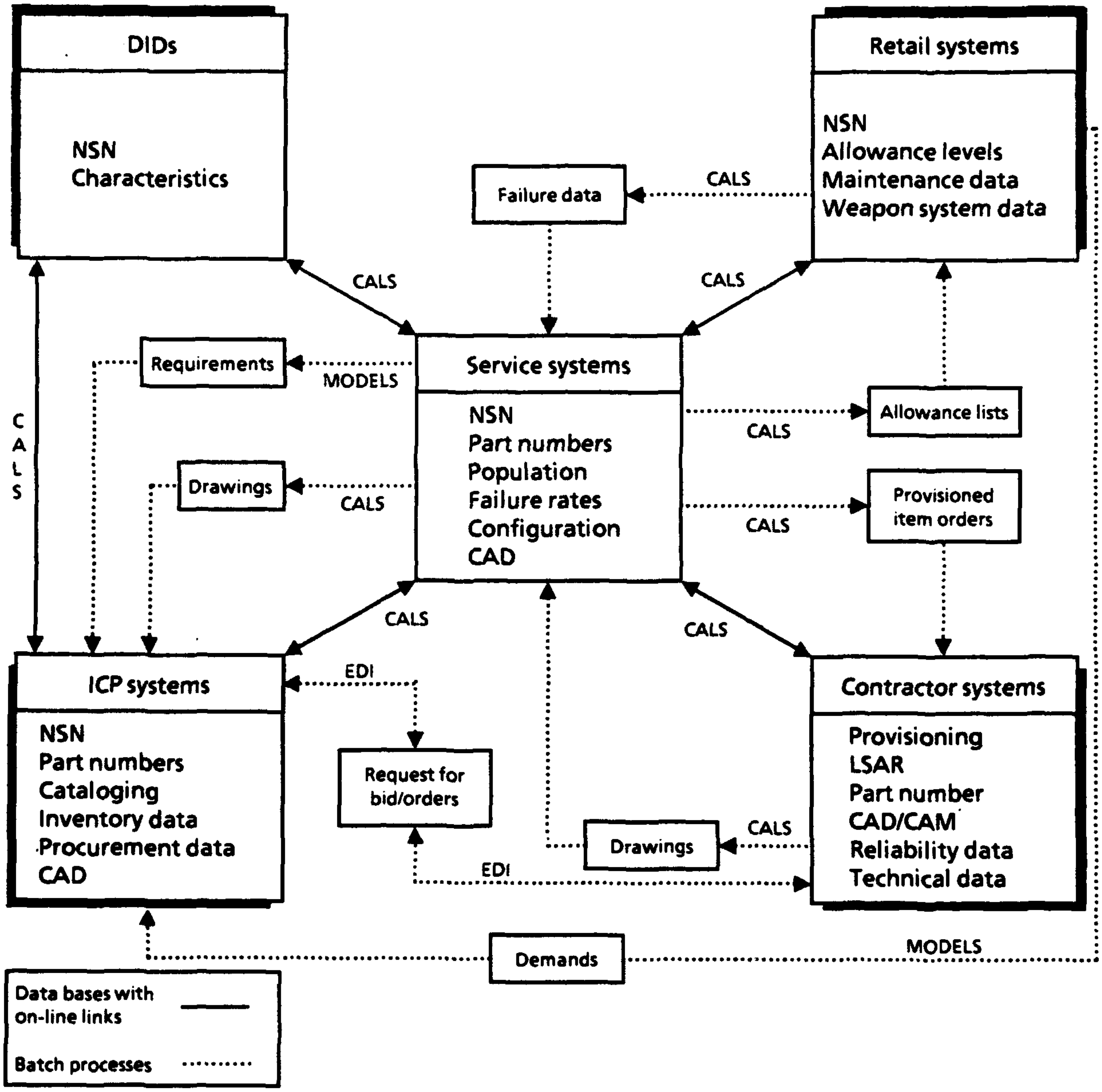


FIG. 2-3. INTEGRATED WEAPON SYSTEM DATA BASE CONCEPTUAL DESIGN

$165 per year.[6] Thus, an effective parts control program could result in a one-time savings of at least $50 million and an annual savings of $1.6 million.[7] The DoD Parts Control Program is designed to encourage the use of standard parts in weapon system designs. The item entry control cataloging processes screen out duplicate items. An important aspect of both parts control and item entry control is a characteristics search.

TABLE 2-1

IWSDB FUNCTIONAL USE TABLE

Data bases		Integrated material management				Weapon system management					
		Asset management	Secondary item procurement	Requirements determination	Cataloging	Asset visibility	Parts control screening	End-item maintenance	Modification planning	Weapon system procurement	Allowance determination
IWSDB	LSAR			•	•		•				•
	Configuration status control								•	•	
	End-item distribution			•					•		•
	Technical data repository	•	•							•	
	Technical data index		•							•	
	Technical manuals							•			
OTHER	Maintenance files	•						•			
	DIDs				•		•				
	Inventory control	•	•	•		•					•
	Procurement files	•	•			•					
	Warehousing and distribution	•	•			•					

A characteristics search depends on the ability of the system to identify specific NSNs that match particular characteristics. Because design engineers have only a

[6]Capt. James E. Diene, USAF. "The Feasibility of Using a Data Base Management System to Aid in Piece Part Standardization and Substitution," Air Force Institute of Technology (unpublished thesis), September 1986.

[7]Calculation based upon an estimate of reducing the average number of new items added per year (200,000) by 5 percent.

limited capability to search among existing items to find one that matches physical and performance parameters, new items are incorporated in the design and introduced into the supply system when existing items could be used. This increases program cost, slows the schedule, and proliferates unnecessary items in the supply system. Providing design engineers with a faster and easier characteristics search capability would speed weapon system design and reduce logistics support costs.

Under current procedures, contractors have stated that it can take weeks to search manually for a part that fits the required design characteristics, while it takes only 30 minutes to write up the justification required to use a nonstandard part.[8] Waiting until pre-provisioning screening to discover that an NSN already exists and can be used is too late to save the greatest amount of money. By that time, 70 percent of the costs required to add a new part have been spent.[9]

Parts characteristics search tools are available today, primarily on optical disk systems for personal computers. DLA is modernizing its LOGRUN to provide similar capabilities through on-line access to its DLIS data base. Contractor design teams should be required to make extensive use of such tools. Characteristics search will be a required function of the IWSDB.

Nonstandard Parts Requests

The DoD parts control program mandated for all weapon system acquisitions requires that contractors obtain advance approval to use nonstandard parts in weapon system designs. Standard parts listings are maintained by Military Parts Control Action Groups (MPCAGs) located at the four DLA hardware supply centers. DLA has taken action to improve the processing and review of nonstandard parts requests by developing the Modernized Parts Control Automated Support System (MPCASS). The system is now installed at selected contractor facilities for testing. MPCASS allows the contractor to review standard parts listings and process nonstandard parts requests on-line. It also gives the Government parts control engineers better research tools. MPCASS simplifies and speeds the preparation and approval of nonstandard parts requests, but does not provide characteristics search capability or additional technical information to design engineers.

[8] *Ibid.*

[9] *Ibid.*

Under current procedures, the MPCAG researches a particular nonstandard parts request and recommends approval or disapproval to the weapon system program manager. If there is no challenge, it is assumed that the recommendation has been accepted. In theory, no nonstandard parts should later appear on provisioning parts lists (PPLs) unless they have been previously approved. A General Accounting Office (GAO) audit in 1986 revealed that a large percentage of the parts control recommendations were never implemented in the final provisioned design.[10] There is no automated system in place to ensure that parts control decisions are enforced. CALS technology can make a major contribution to parts control enforcement through integration of MPCASS and provisioning data systems. Making parts control decisions available to provisioning and NSN assignment personnel could prevent nonapproved, nonstandard parts from entering the supply system.

With MPCASS and characteristics search implemented DoD-wide, it would be possible to transfer parts control responsibility to the contractor and reduce the Government's role to that of auditor. The contractor has intimate knowledge of the weapon system design and the physical and performance requirements of piece parts and is in the best position to judge the ability of existing parts or standards to meet design requirements. The Government could concentrate on setting guidelines for the contractors to follow when making parts control decisions and audit those decisions after the fact on a sample basis. This would preserve the Government's prerogative to set and enforce parts control policy but would eliminate the delays when data are passed to organizations that are not as well positioned to make the decisions. Appendix C shows how this can significantly speed up the process.

Provisioning

The Government provisioning process today is predominantly a sequential, batch process that does not begin in earnest until after delivery of PPLs. The contractor usually does not submit these lists until the weapon system design baseline has been established. Once received, Government screening, item description, item entry control, NSN assignment, requirements computation, procurement, receipt, and storage must take place, generally in a sequential manner, with heavy reliance on paper products. There is usually not enough time to complete this process

[10]General Accounting Office Audit Report, *Management Review: Progress and Challenges at DLA*, April 1986.

and to get material on the shelf before the equipment must be deployed to the field. This delay creates an interval that requires contractor-provided support even for stable baseline items that could have been organically supported.

The sequential steps in the process are listed below. The CALS improvements that are possible are described in detail in the paragraphs that follow.

- Preparation of provisioning technical documentation (PTD)
- Part number screening for NSNs
- Submission of PTD, SPTD, and DCNs to the Government
- Technical and management code assignment
- Government acceptance
- Requirements computation
- Supply support requests (SSRs)
- Screening, item description, and NSN assignment (cataloging)
- Updating the contractor's LSAR
- Initial procurement of spares.

Preparation of Provisioning Technical Documentation

The preparation of PTD for submission to the Government usually does not begin until after the design drawings have been released from contractor engineering to a separate contractor logistics organization. These are usually submitted as one large package near the end of the design process but may be done as an individual system, subsystem, or component as design work is completed. Once delivered, the data are loaded into the contractor's LSAR.

During the loading process, the provisioning engineers manually enter parts information into the LSAR from the material lists on the design drawings. Then, they input the results of other analyses into the record, usually manually. The peacetime maintenance replacement rates (MRR) must be derived from mean time between failure (MTBF) reliability engineering estimates, the actual results of reliability tests and demonstrations, or obtained from historical data for similar items and applications. Wartime rates must be derived in a similar manner. Both of these tasks require a complete understanding of the end-item operating

considerations: number of hours per mission; number of missions per year; operational variations due to climate, etc. These rates must also meet system operational availability (Ao) requirements. Similarly, the source, maintenance, and recoverability (SMR) code must be derived from the level of repair analysis (LORA) and must agree with the maintenance plan. The maintenance task distribution (MTD) must be derived from the maintenance task analysis portion of the LSAR, which is based upon the failure modes, effects, and criticality analysis (FMECA) and must agree with the Service maintenance structure, personnel, and training requirements for the system. These are just a few of the codes that the provisioning engineer must add to the LSAR in what is a very time-consuming process.

Preparation of PTD can be accelerated and made more accurate by using incremental provisioning. Automating the process described above to derive a portion of PTD (logistics data) from other LSAR (engineering) information would ensure greater consistency and accuracy of the LSAR and would speed provisioning by reducing the manual work required to build PTD. The B-2 LSMIS, developed by Northrop Corporation for the Air Force, provides some linking between the engineering data base and the LSAR data base to assist the provisioning engineer in developing LSAR. As the IWSDB and PDES are implemented, the preparation of PTD as a separate function can be eliminated. The data can simply flow out of the design process.

Part Number Screening for NSNs

At the same time that PTD is being developed, SPTD must be developed for each recommended provisioning item not previously cataloged and assigned an NSN. Government catalogers use SPTD to prepare item identifications. Contractors submit part number screening requests for recommended provisioning items early on to determine which items are not cataloged and require SPTD development. These screening requests are usually mailed, although the use of the Automatic Digital Network (AUTODIN) is authorized when it is available. Once processed, Defense Logistics Services Center (DLSC) returns the results to the contractor by mail or AUTODIN, along with hard-copy printouts of the results of screening. Screening results include probable, possible, partial, exact, or no matches. Only the parts with exact matches and no matches can be processed without further manual research.

Depending upon the capabilities of the contractor, these results are either processed automatically or entered manually from the hard copy.

This is the first step, and the first of many screenings, in the item entry control process.[11] Contractors must know as early as possible whether an NSN exists in order to prepare or procure adequate technical data. Some contracts require that the screening results reflected on the PPL be less than 60 days old at the time of Government receipt. This causes repetitive screening by the contractor.

Better contractor access to Government data bases and Government acceptance of searches made against commercial products using Government NSN data bases would help reduce the number and cycle time of part number screenings. The IWSDB should incorporate part number screening.

Submission of PTD, SPTD, and DCNs to the Government

For many contracts, the provisioning line item in the contract calls for one submission of the complete provisioning package by a specified date. In such cases, the Government has 60 days to accept or reject the package. Some contracts authorize the incremental submission of provisioning. These contracts allow the Government 30 days to respond to each increment. Parts listings can be in the form of hard copy, punched card, or magnetic tape. The SPTD is mailed separately, either as hard copy or aperture cards. Because the Government relies on manual processes, it is very difficult, and in some cases impossible, for the Government to review these packages within the scheduled time.

Technical and Management Code Assignment

The contractor's participation in provisioning culminates with the provisioning coding conference, at which the Government selects support items and assigns or reviews technical and management codes. These codes determine whether the items will be (1) stocked or procured on demand, (2) repaired or discarded, and (3) managed by the Service or DLA. Key requirements computation codes are also reviewed. Some of these codes may have already been recommended by the contractor, depending on the requirements of the contract, and these are reviewed and can be

[11]The Service also screens before submission of an SSR to DLA. DLA Centers screen again before cataloging.

changed by the Government. Other codes are directly assigned by Government personnel.

The provisioning conference is a face-to-face meeting that typically lasts for a week or more. The contractor is required to provide personnel who have knowledge of the reliability and maintenance characteristics of the end item. In some cases, the PPLs used at the conference may have been provided by the contractor. In other cases, the PPLs have already been processed into the Service provisioning system, and Service-prepared reports are used. In either case, the information in the PPL is weeks or months old.

The provisioning process can be expedited by providing current information as it is developed to Government provisioning personnel. This can reduce the provisioning time by allowing review, approval, and processing of provisioning data to begin as the system is designed. A step toward this concept is an initiative known as the CITIS that allows PMs to have on-line access into contractors' systems. CITIS access into the LSAR and the technical data repository can greatly expedite the provisioning and cataloging review and approval process. CITIS is a step toward creating the future IWSDB.

Of the operating provisioning systems that we have reviewed, the Air Force/ Northrop B-2 LSMIS is the most promising on-line system. LSMIS allows Air Force provisioning personnel to review and annotate provisioning data in real time. Contractor/Government differences can be resolved quickly on-line, reducing the number of items which need to be reviewed at provisioning conferences. AI could be used to take this one step further by developing logic to search the LSAR data base for potential data inconsistencies. For example, the AI system could flag the fact that failure rates for piece parts for a particular component conflict with the reliability allocation for the same component, or that the estimated price is out of line with similar items.

As data sharing and AI are introduced, functions can be consolidated requiring fewer people. Since each individual would be responsible for a broader range of functions, expert systems could increase productivity by performing simple functions automatically and highlighting the more complex functions for action by technicians. In addition, CALS can reduce much of the duplicative effort that takes place between contractor and Government.

For example, one weapon system provisioning process that we examined required that both the contractor and the item manager compute spare parts requirements. That same process required Government provisioning personnel to manually verify that the data on LSA provisioning reports submitted by the contractor were identical to the data manually reviewed previously on contractor-submitted worksheets. With an effective integrated system such redundancy could be eliminated, saving valuable resources.

Government Acceptance

The contractor submits LSAR to the Service for input into its automated provisioning system. Each Service has a different automated provisioning system with unique Service requirements, each of which pre-dates the LSA process and data structure. The variance between Service requirements has been a major contractor complaint. In some cases, contractors have had to create multiple internal LSAR systems in order to satisfy the data delivery requirements of each Service. This is particularly a problem for a Joint-Service weapon system acquisition contract.[12] None of the Services has an operational internal LSAR data base repository. Because of this, when provisioning is submitted in LSA report format, it must be pre-processed through conversion software. Some of the provisioning data submitted are still in hard-copy format and must be manually input. Since the long-term CALS plans for an IWSDB center around the LSAR, a Service LSAR repository that meets current standards is essential.

Once the initial provisioning has been accepted by the Service and has been entered into Service files, the data can be changed only by a DCN. DCNs are created when an ECP is approved that affects support requirements. As previously discussed, the volume of DCNs that must be processed can be significant. Each Service ICP identified DCN processing as a major automated system process requiring improvement. None of the Services can receive and smoothly process an LSAR-produced DCN tape without varying degrees of manual effort, nor can the Service systems easily communicate changes to the appropriate DLA supply center.

The DCN process at one of the more automated Service ICPs is shown in Figure 2-4.

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[12]Questionnaire responses enclosed with Aerospace Industry Association (AIA) letter to John A. Mittino, Deputy Assistant Secretary of Defense (Logistics), 18 July 1989.

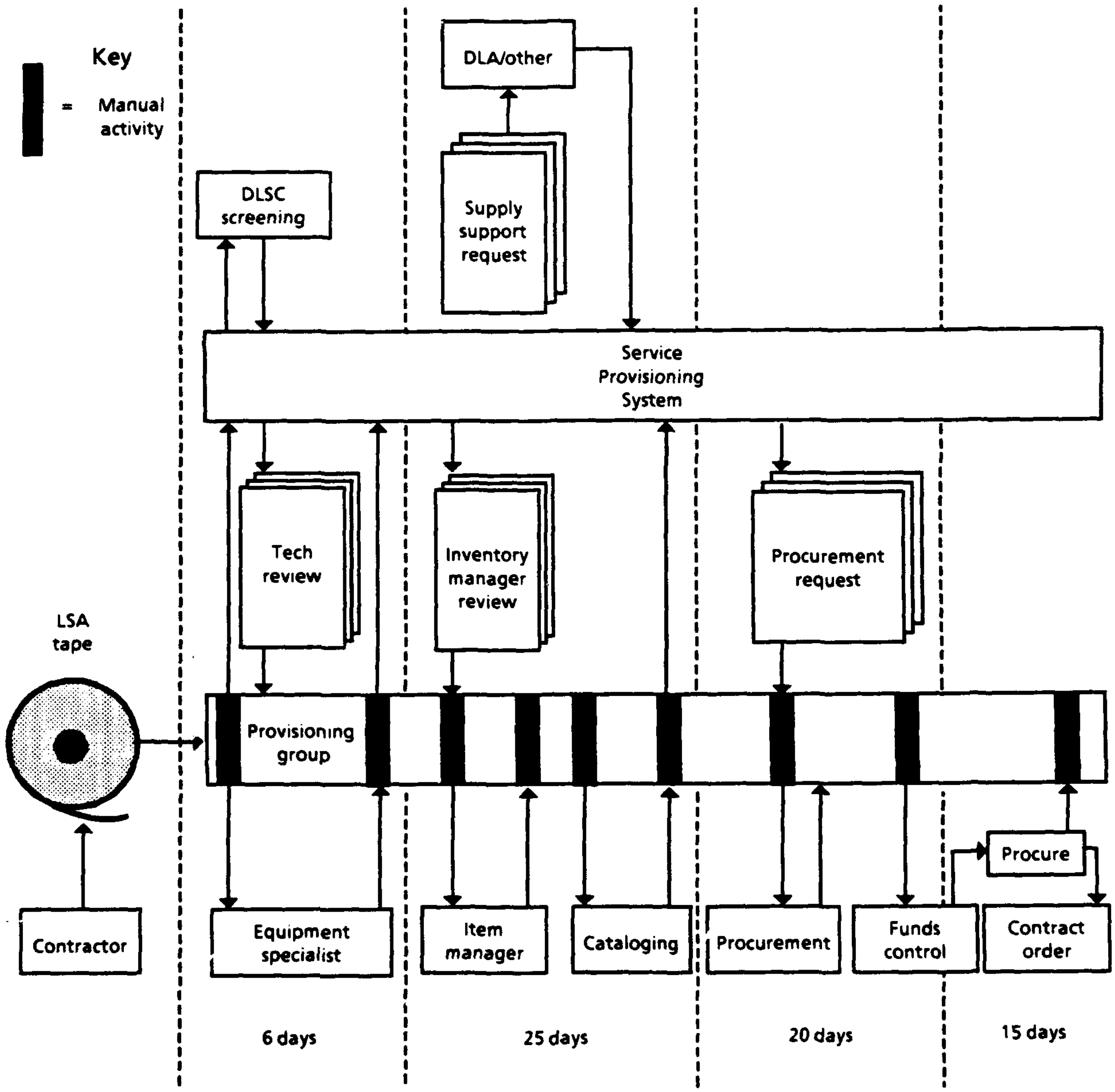

FIG. 2-4. AUTOMATED DESIGN CHANGE NOTICE PROCESS

Concurrent engineering has the potential to reduce the number of weapon system design changes. For those that still occur, CALS can make pending design changes known to the supply system earlier, allowing the supply system to modify provisioning actions already taken or to suspend provisioning actions until the design has been stabilized. Use of expert systems can help speed DCN processing.

Requirements Computation

The provisioning process may create new inventory items or may simply increase the requirements for items already stocked. These items, either new or existing, can be Service-managed or DLA-managed. Both cases require some form of requirements computation. For DLA-managed items, an SSR is used to convey the results of the computation to DLA. The requirements computation methods vary widely: they can range from highly sophisticated readiness-based sparing models using reliability data to "intuitive" estimates made by experienced technicians.

The division of responsibility between Government and contractor varies widely. There exists, in Government, a persistent lack of confidence in contractors' engineering estimates and recommended quantities. On the other hand, contractors complain that the Government "second guesses" their analyses and overrides their recommendations without sufficient justification. What has emerged is a process that depends upon many iterative reviews and much duplication of effort. Neither side feels that the process produces the correct range and depth of spares needed to support the system.

There is quantitative evidence to suggest that this criticism is justified. After reviewing SSR estimates for initial provisioning with actual demand, DLA published a report that stated that the estimated quantity exceeded demand by 349 percent.[13] A recent paper on the fielding of the Apache helicopter found that only 50 percent of the repair parts required had been provided.[14] Items that were known to be required every 20 flying hours were not supplied. On the other hand, 50 percent of the items provided were never requested.

One reason for inaccurate requirements computations is the failure to compare initial estimates with actual experience. Ideally, data from each maintenance level should flow back to adjust the maintenance factors when provisioning similar items. Studies that compared estimated maintenance factors used for initial provisioning with actual values have found that the maintenance factors in initial estimates accounted for only one-quarter of the actual demand. A report recommended using

[13]Capt. Arnett (USAF) and Frank Pender, *Report on a Comparison of Forecasted Provisioning Requirements Versus Experienced Demand*, DLA, March 1985.

[14]Major Robert G. David, *Fielding the AH-64, Logistics Lessons Learned*, (Department of the Army unpublished report), April 1988.

early operational data to modify initial estimates for initial provisioning procurements.[15]

Without a system that measures the quality of the process, it is difficult to apply lessons learned to improve supply support for future weapon systems. This is one reason that a recent review of the provisioning process strongly emphasized the need to establish a measure of effectiveness. The CALS IWSDB concept could provide the actual maintenance data needed to measure the effectiveness of provisioning.

Another factor that must be considered in the Services' requirements computation is the actual demand experienced while the end item was under interim contractor support. Reliance on contractors for the initial support of new weapon systems is often necessary and will likely increase in the future as the acquisition process becomes more streamlined. CALS Government/contractor data integration into an IWSDB can make asset and consumption data more easily available to ICPs. Increased Government/contractor data integration could also make life-cycle support of source/controlled and design-unstable items more economical and effective. This could be accomplished by assigning management and configuration control of the item to the contractor while improving the Government's auditing capability to ensure reasonable pricing and inventory investment.

Computer-aided Acquisition and Logistic Support can improve requirements determination and subsequent inventory levels through better visibility of relevant factors and better timing of decisions. When properly implemented, CALS can reduce duplication of contractor and DoD activities. CALS technology links between contractors and Government offer an opportunity to substantially restructure processes and responsibilities.

Supply Support Requests

For DLA-managed items, the Service must prepare and send an SSR to the appropriate supply center. Since in the near future DLA will assume management of nearly all consumable items, the number of SSRs forwarded will grow significantly. Several Service ICPs complained that the rejection rate of SSRs was too high. They felt that many of the input problems could be resolved by DLA's data processing systems instead of rejecting the SSRs back to the Service for action. Many rejected

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[15]Office of the Assistant Secretary of Defense (Production and Logistics), *Provisioning Process Report*, May 1990.

SSRs must be completely resubmitted because the system automatically cancels the original SSR, thus increasing the workload. Also, the DLA procedure requiring a mandatory re-review by the Service of each SSR that exceeds $10,000 was questioned. Front-end, AI logic should be developed to improve the SSR process and to reduce the rejection rate.

Supplementary provisioning technical documentation is required to be submitted with SSRs for new items but cannot be sent via AUTODIN along with the SSR. The SPTD, which consists primarily of development drawings and catalog tear sheets, is usually mailed as aperture cards or hard copy. The DLA supply centers must match the SPTD received through the mail with the SSR that had been received via AUTODIN. This can be a slow task in spite of the use of matching control numbers. Failure to match SPTD to its related SSR can cause rejection of the SSR or inadequate control of item entry. Transmitting SPTD in digital format along with the SSR could eliminate this problem. A possible solution is the EDI Transaction 841, Specifications/Technical Information, used to transmit both text and graphics information.

The DLA supply center cataloging sections will soon be using CTOL workstations to catalog parts. The SSR data will be batch-input into CTOL. Under the present CTOL prototype process, the SPTD is input using scanners located near the CTOL equipment. An SSR control number is used to link the SSR to its technical data.

The supply centers are also converting their aperture-card-based technical data repositories to digital, optical-disk-based repositories of the Engineering Drawing Management Information Control System (EDMICS). These repositories are primarily used to store the production drawing package that is usually submitted much later than the supplementary provisioning technical data. These data will either be scanned using EDMICS equipment or be received in a CALS-compliant digital format from the contractor or Service. These drawings support second-source procurement. They are indexed and stored by drawing reference number and vendor. SPTD is not routinely stored in the present repositories. DLA plans to link CTOL with EDMICS. Using EDMICS to receive and store SPTD would reduce the workload, improve access to the SPTD, and reduce the number of rejected SSRs.

The manual effort required to prepare, transmit, and process SSRs could be reduced considerably through use of the DLA DRAMA. DRAMA is a prototype AI application that monitors LSAR changes in either Service or contractor data bases and initiates appropriate ICP actions. For example, appearance of a changed quantity requirement for an item in the LSAR would automatically result in a DRAMA notification to the ICP procurement section to modify the purchase request or solicitation for the item without the workload or delay caused by preparing and processing an SSR.

Screening, Item Description, and NSN Assignment

When DLA receives an SSR for a new item, the part must be screened, an item description prepared, and an NSN assigned before it can be procured. A similar process takes place for Service-managed items. The screening by reference number or characteristics is another attempt to determine whether an NSN already exists for the new item.

More than 98 percent of the matches with NSNs that are made during the item entry control screening process are by a reference number. Still, roughly 50,000 items each year are assigned new NSNs because they do not match by reference number or characteristics. A number of these items might have been matched to existing NSNs had all the known reference numbers been recorded in the item record. While there are a number of reasons why all reference numbers do not get recorded in the item record, the reason most germane to this report is the limited capacity to store reference numbers in the LSAR or to transmit them in the SSR.

The CALS approach to integrating Government and contractor logistics files can greatly expand the Government's access to vendor part number information. There are over 5 million individual items in the Federal cataloging system today. Many of these items have multiple sources of supply and many alternate reference numbers. Maintaining currency of a data base of this size is a major challenge. As vendors change their part numbers, modernize and improve the items that they provide, go out of business or merge with other companies, or remove products for whatever reason, the Federal files should be updated. Near real-time access to contractor reference number and other vendor data could help alleviate significant problems in maintaining accurate catalog files. The DLA Government industry

reference data edit and review (GIRDER) program should be upgraded to include real-time access.

An item identification is prepared for each new item that does not match an existing NSN. The *Federal Item Identification Guide* (FIIG) is used to choose the item name. The FIIG consists of a number of mandatory and optional questions regarding item characteristics. The answers to those questions are recorded as the item's identification. If all mandatory questions can be answered, the item is considered fully described. If any of the mandatory questions cannot be answered, the item is considered partially described. If none of the mandatory questions can be answered, the item is considered described by its reference number only. Cataloging policy requires that, except for military specification items and other exceptions, full descriptions be obtained whenever possible.

Item descriptions are used for a number of purposes ranging from parts selection during weapon system design, to aiding NSN selection for requisitions from the field, to identifying potential duplicate or substitutable items for item reduction/standardization. While it would seem that the more characteristics recorded for an item the better, it is more efficient to identify uses of the item and limit the characteristics recorded to only those which are actually needed.

As examples of the limited need for characteristics data, consider that designers probably look for only certain key characteristics to determine suitability of a part. Users requiring high-technology parts for weapon systems buy by part number only as the main assurance of suitability. Item-reduction studies rely on characteristics data only to group like items and then rely on source technical data to conduct actual technical reviews. Therefore, a high-technology component with a highly specialized use, for example, might require that only a few key characteristics be recorded, or none at all.

Limiting item identifications to the minimum necessary reduces the workload required for NSN assignment, reduces the storage and transmission requirements for item records, and speeds up characteristics search routines. DLA is reviewing FIIGs on a time-available basis to identify areas for simplification, but this program should be accelerated to ease future development and processing efforts.

Most of the difficulty and delay in assigning NSNs is caused by the need to gather and send adequate technical data from vendors to the contractor and from the

contractor to the Government in order for Government catalogers to develop item identifications. Technical data are often either not obtained nor developed by the contractor, not sent to the Government, or received by the Government but not matched to the SSR to which they relate. If technical data do not arrive before the ICP deadline for NSN assignment, an NSN is assigned based on reference number only. Partial- and reference-number descriptions can create duplicate NSNs (when identical parts are identified by different reference numbers) and provide inadequate characteristics data for parts control, requisitioning, and item-reduction studies. Workloads usually prevent catalogers from returning to upgrade reference-number-only item identifications once technical data have been received. As shown in Table 2-2, only 40 percent of NSNs are fully described.

TABLE 2-2

CURRENT FEDERAL CATALOG STATISTICS

NSN status	Total	Percent
Fully described	1,936,060	40
Partial	1,835,556	38
Reference	1,043,660	22
Total	4,815,276	100

If the contractors prepared the item identifications, delays would be avoided in technical data transmittal. Contractor item identification could also produce more accurate descriptions to identify items than if they were prepared by Government personnel whose descriptions must be based on whatever technical data are available for it. Attempts to have contractors prepare item identifications have been unsuccessful in the past largely because of disagreements with Government catalogers over names to be used, over formatting and potential contractor conflict of interest in slanting descriptions to ensure a sole source for some items. Government personnel ended up making 100 percent quality control inspection of contractor item identifications, which eliminated any saving.

Cataloging tools on-line can overcome some of these difficulties. While CTOL will not help with the initial step of naming items, it will allow standardized item

descriptions to be prepared once the name has been selected by stepping the cataloger through the FIIG questions and formatting replies that will pass Government edits. Conflict-of-interest concerns can be alleviated by auditing contractor item identifications. CTOL and greater access to contractor data bases through CITIS or the IWSDB will make audits more effective.

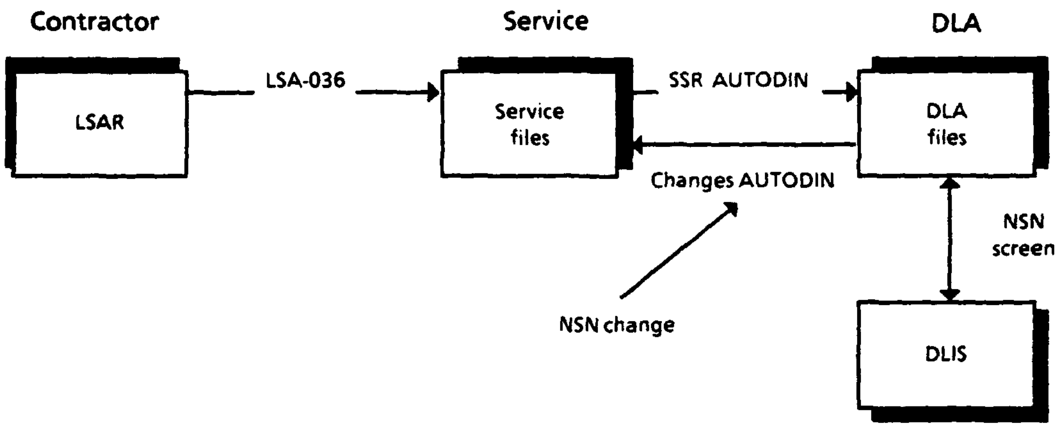
Shifting item identification responsibilities to the contractor, with the Government retaining policy and audit control, would reduce the delays in transmitting technical data from contractor to Government, would allow the personnel most familiar with the items to describe them, and would be a step toward the ultimate goal of including product descriptive data as as integral part of the IWSDB. Product descriptive data in the IWSDB will follow PDES standards and will be developed as an integral part of the design process. By that time, separate item identification processes will no longer be required.

Updating the Contractor's LSAR

During cataloging, part numbers may be reformatted, items may be matched to NSNs, alternate reference numbers and vendors may be located, substitutes may be recommended, etc. It is important that DoD provide changes to the *contractor* so that the source data files can be updated. Figure 2-5 illustrates how failure to transmit the results of Government screening back to the contractor can corrupt the contractor's files. Examples were cited of initial provisioning items ordered from the prime contractor that could not be identified on receipt because the Government had changed the contractor's reference numbers. Updating the contractor's LSAR as the result of Government processing would allow better visibility of the provisioning process to the contractor and the PM. The IWSDB can close this loop between Government and contractor files.

Initial Procurement of Spares

Proper timing is an essential element in the initial procurement of provisioned items. If provisioning is made too late, spare parts are not stocked and available when the weapon system is fielded. If provisioning is made too early, continuing design changes can cause a flood of DCNs. As DCN volume increases, the time required to process provisioning actions increases, leading to pressure to start provisioning even earlier, which leads to more DCNs, and so on. ICPs must sort through all DCNs to find those that have supply implications and deduce their



Note: DLIS = Defense Logistics Information System.

FIG. 2-5. LOGISTICS SUPPORT ANALYSIS RECORD UPDATE

effects, such as quantity change or part substitution, and based on the DCN, they must modify or terminate procurement actions that no longer apply. If workloads become overwhelming, DCN additions are processed first and deletions are postponed or are never completed. This practice leads to purchase of inapplicable parts.

Premature investment in organic support capability can be extremely expensive if later design changes make obsolete the spare parts already procured. Major Government provisioning should take place after the design has stabilized. Besides procuring the wrong parts, maintaining data bases becomes much more complex once the contractor formally submits PPLs to the Government. This is illustrated in Figure 2-6.

Before PPL submission, the contractor has complete responsibility for data base update, principally the LSAR file. After PPL submission, the Services must maintain their in-house provisioning files, the retail users maintain inventory files, DLA (for DLA-managed items) maintains inventory and procurement files, and DLIS must be maintained. All of these files may be affected by a DCN.

Integrating the contractor's engineering and logistics data bases with the Service's data bases into the IWSDB could significantly reduce provisioning workloads and the inapplicable asset inventory. Using CALS, the provisioning

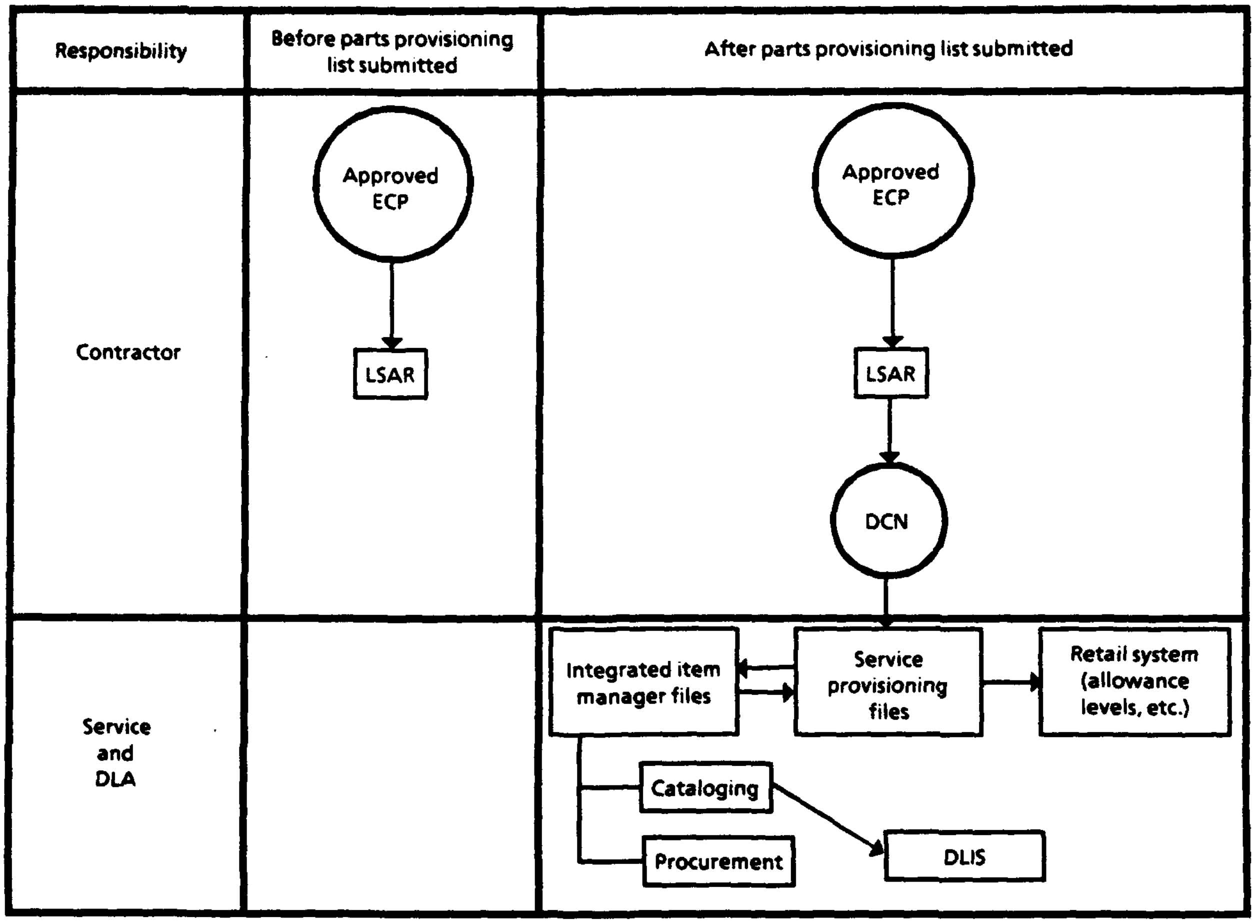


FIG. 2-6. THE EFFECT OF DESIGN CHANGES ON PROVISIONING DATA

process could be changed to automatically monitor the design stability of components through interpretation of LSAR status. As soon as design stability was detected, provisioning could start. Actual procurement would be suspended until "just in time" for MSD. Items that had not stabilized would not be provisioned and would remain the contractor's responsibility for supply support until design stability was reached.

If items were provisioned as they reach design stability rather than in large batches, the provisioning workload could be leveled.

Inventory Management

Replenishment of Spares

Computer-aided Acquisition and Logistic Support technology can make the supply system more productive by reducing inventory levels. CALS can lower the

inventory levels by reducing the administrative and procurement lead time to buy replenishment parts. Use of digital technical data packages in solicitations and use of integrated contractor/Government EDI (paperless) procurement systems can reduce administrative lead times. Use of RAMP technology and PDES can reduce production lead time by providing design and production data in digital format directly readable by a manufacturer's CAD/CAM and numerically controlled equipment.

Ultimately, direct user-to-supplier ordering capability using CALS and EDI could allow the Government to rely entirely on commercial distribution for some items, completely eliminating the need for the Government to stock them.

Catalog Maintenance

The DoD Interchangeability and Substitutability (I&S) program and DLA's item-reduction studies are designed to reduce the number of duplicate or redundant items in the system. Duplicate items enter the system through the provisioning process when item entry control fails or is bypassed. However, many redundant items exist because a newer, better item enters the system replacing the older item.

Significant manual effort is required to perform I&S and item-reduction studies. Often, the technical data needed to perform these studies are unavailable or hard to find. It is difficult to compare the characteristics of many items from the technical data alone. Once a part is declared a duplicate, the Services must perform an engineering review and reach concurrence. The Service review determines where and how the candidate items are used in weapon systems. Because this information is not readily available today, deletion of the item can fail to receive concurrence if workloads do not permit extensive research. Such nonconcurrence has a doubly negative impact: duplicate items remain in the system, adding to logistics support costs, and the resources used to identify the duplicate items are expended to no purpose. The IWSDB will provide where-used and how-used information for item-reduction reviews.

RECOMMENDATIONS

Short- to Mid-Term (1991 to 1997)

We recommend that the ASD(P&L) include the following short- to mid-term recommendations in the migration strategy for the LCIM:

- *Direct more extensive use of phased provisioning based upon design stability.* The provisioning of components should start as soon as the design stabilizes. Interim contractor support will only be required for those items that take longer to stabilize. With the exception of SAIP procurements, the orders for spares should be held until they can be delivered just in time for the need date. Provisioning unstable designs should be avoided to prevent DCNs. This would greatly reduce the number of inapplicable asset items that enter the inventory through initial provisioning. A modification to the LSAR would be needed to indicate design stability. AI logic and other software should be developed to monitor design stability.

- *Direct the use of CITIS to permit small-batch review of provisioning records and to eliminate the provisioning coding conference for all but exception items.* By reviewing provisioning data on-line in the contractor's system as it is generated, the need for face-to-face meetings can be significantly reduced and the provisioning process greatly speeded up. When combined with AI systems to aid in review, fewer Government personnel would be needed and better quality provisioning data would be produced.

- *Improve the processing of technical data.* Develop, test, and widely implement the submission and processing of SPTD in digital format. Upgrade and fully implement the MEDALS technical data index. Develop software to monitor the status of technical data package submissions to replace the SPTD in Government data repositories. These actions would improve the quality and usefulness of the characteristics data in the Federal catalog and would permit fewer duplicate items to enter the system.

- *Direct the testing of contractor preparation of item identification data.* Given tools like CTOL, item identification can be performed effectively by the contractor, who is best suited to describe the parts that he designed. More items will be fully described requiring fewer new NSNs. This would also decrease Government personnel requirements and the time required for system provisioning. Contractor item identification should be developed and tested in selected programs to determine its effectiveness.

- *Use CALS techniques to improve DCN and SSR processing.* The inefficiency of the SSR and DCN processes is a major problem. Develop AI logic to reduce the SSR rejection rate. This can greatly reduce the manual effort required by the Services to resolve SSR problems. Refine and implement DRAMA as a step toward elimination of SSRs and DCNs as separate, batch transactions,

which would drastically reduce processing times. Develop automatic methods to update the contractor's LSAR to match Government cataloging actions. This would eliminate mismatches that occur when placing orders plus give the PM better visibility of progress.

- *Test the transfer of parts control functions to the contractor.* Provide contractors with access to LOGRUN to make characteristics searches. Expand MPCASS to contain this function. Reduce Government parts control personnel to a policy/audit role. Modify the LSAR to store the results of parts control activity so it can be enforced during provisioning. This can reduce the number of new items entering the system while at the same time speed up design. This concept should be tested in selected programs to determine its effectiveness.

- *Improve reference number processing.* During screening, most NSN matches are made by reference number searches. The GIRDER program should be expanded to provide real-time access to supplier part numbers. AI techniques should be developed to scan the LSAR for potential omissions in vendor data. Service provisioning systems should be expanded to allow for the submission of additional reference numbers. These actions can reduce the number of duplicate items entering the system and reduce downstream Government labor required for item reductions.

- *Improve the tailoring of logistics requirements.* Promote and expand LOGPARS to improve the manner in which the LSA is tailored. This can reduce the labor required to prepare for a major acquisition and eliminate much of the waste associated with the overspecification of data requirements.

Long-Term (1998 to 2010)

We recommend that ASD(P&L) take the following steps to improve the supply process in the long term:

- *Eliminate provisioning data generation as a separate function.* This function should be absorbed during CE and provisioning data would be created as the system is designed and recorded in the IWSDB.

- *Ensure that the PDES specification includes all item identification data requirements necessary for logistics purposes.* This can completely eliminate the manual activity associated with preparing item descriptions.

- *Ensure that supply functional requirements are adequately addressed in the IWSDB design.* These requirements include

  - Access to interim contractor support data

- Real-time DCN processing
- Provisioning performance measuring
- Elimination of SSRs
- On-line access to SPTD
- DLA on-line access to vendor reference number data
- Design stability visibility
- Provisioned item order processing and status
- Technical data package linkage to LSAR with due-in tracking
- Inventory investment related to weapon system
- Near-real-time response to changes in operational requirements
- Part number demand visibility
- Item-reduction study, review, and concurrence
- Inactive item program review and approval
- Life-cycle maintenance of LSAR.

CHAPTER 3

THE STRATEGY FOR CALS IMPLEMENTATION

INTRODUCTION

Chapter 2 discussed specific supply process improvements made possible by CALS technology initiatives, both in the short and long term. This chapter discusses the management strategy needed to accomplish those process improvements in the most efficient manner possible. The discussion addresses three major implementation issues:

- *Management control.* A number of management alternatives exist. CALS implementation in supply can either be centrally controlled or decentralized. Service provisioning procedures and requirements can be standardized to facilitate transition or continue to vary. Leadership can be provided by the CALS technical specialists or the supply functional experts.
- *Policies.* What is possible to do technically may differ from what actually is accomplished because of legal, political, and economic factors. This is especially true in the area of Government/contractor relationships. Unless these policy issues are resolved soon, costly capabilities may be developed which will never be used.
- *Cultural change.* Introducing CALS into supply will affect nearly every supply management function. Obtaining rank-and-file understanding of and support for CALS changes will be important.

ASSUMPTIONS AND CONSTRAINTS

Our proposed CALS management strategy is based on the following assumptions and constraints. The strategy may require revision over time depending on the extent to which these assumptions vary from actual events.

- A level of funding will be programmed over the long term which permits reasonable progress toward the highest priority CALS improvements. Inadequate funding could lead to a loss on early investments and to a stretch-out of the program which could hamper compatibility between newer and older subsystems. Also, industry is watching the level of Government commitment to CALS to determine whether to sustain its own high level of investment in CALS, a key element to the success of Government modernization efforts. Funding levels and policy limitations rather than

technology limits will be the primary constraining factors in implementing CALS improvements in supply management.

- Supply management personnel end strengths will decrease consistent with reductions in military forces and civilian personnel through 1997 as part of a general DoD "build-down." DoD personnel and budget cuts will affect supply organizations at least as much as other elements. The supply work force will have increasing levels of computer and other technical skills and declining levels of functional experience. Retirements of older, more experienced personnel are expected to result from work force reductions. The smaller work force which remains will consist of employees at all levels who are more computer literate but who have less extensive on-the-job experience in supply.

- DoD supply system consolidation efforts will continue. The supply system will be preoccupied with mission changes, resource retrenchment, and consolidation initiatives through 1997. Most key personnel and discretionary resources will be devoted to coping with short-term issues in order to maintain supply support levels during a period of rapid change.

- Industry will continue its current pace of CALS implementation. Those contractors with significant commercial business will be investing in CALS to remain globally competitive regardless of the trends in DoD budgets or CALS investments. Contractors with a heavy concentration of DoD contracts may, however, back away from further CALS investments as DoD acquisition budgets decline.

- As defense budgets fall, more emphasis will be placed on extending the life of systems already acquired. Because of this, the future CALS implementation strategy should stress application of CALS to existing systems and data as well as introduction through new weapon system programs. This will require relatively more data conversion than originally anticipated.

- Technical and telecommunications limitations are expected to delay broad implementation of the IWSDB concept until after 1997. The task of developing shared databases (and the software to take advantage of the new data) is expected to consume most available development resources in the midterm (1993 – 1997). IWSDB activity during the midterm is expected to be limited to foundation building (e.g., data dictionary standardization and telecommunications improvements) and proof-of-concept prototyping.

- Supply system effectiveness must not be degraded during the introduction of CALS improvements. Use of proven technology, phased implementation, and parallel systems operations will be required to ensure continuity of supply support.

MANAGEMENT CONTROL

Functional Leadership

Much of the CALS effort to date has emphasized development of data interchange standards that allow both text and graphics data to be passed from one system to another regardless of the type of hardware or software in the system. This technically-oriented task has been accomplished very well. Now more attention should be focused on how the new CALS capabilities can be used to improve existing supply management processes. CALS expenditures must be limited to cost-effective capabilities that will be used and to preserve proprietary rights where appropriate. These new decisions will require an intimate functional knowledge of the data and processes involved.

Much CALS funding has been expended for feasibility studies and for prototyping efforts within designated weapon system acquisition programs. Once feasibility is proved, however, funds have often not been available within the supply system to develop and implement CALS projects for routine supply operations. Functional managers who control funding for routine supply operations need to be aware of the potential benefits of CALS projects when they set funding priorities.

CALS prototypes created for weapon system programs have understandably been created to solve specific program problems. Such prototypes in many cases cannot be used for wider system applications without major redesign. Supply management participation in the planning of future prototypes should make them more useful to the overall supply system without compromising specific program objectives.

Standardization and Centralized Management

Standardization of supply management processes and their supporting automated data processing (ADP) systems will lower the cost and complexity of implementing CALS. The current array of DoD supply management ADP systems represents the entire range of technology dating from the 1960s to the present. The objective of the LCIM project is to create a standard ADP system that supports standard supply management processes and to migrate standard systems to support improved supply management processes described by the Corporate Information

Management (CIM) project. CALS technology is needed to support supply management process improvements.

Many CALS projects have adopted the strategy of developing CALS capabilities around existing systems to avoid large system modification expenses. This strategy would result in each Service's CALS implementation being unique due to its particular interface with existing systems. While Service-unique CALS implementation is cost effective at the Service level and is relatively easy to manage and implement, it may be more costly when viewed from the DoD-wide perspective.

The potential savings in pursuing a Joint-Service CALS implementation is supported by two considerations. First, LCIM efforts will have the effect of increasing the standardization of existing systems, thereby making a standard CALS infrastructure more feasible. Second, the high degree of system integration required to take advantage of the IWSDB will eventually require system modifications to facilitate integration. It may cost less to standardize and integrate existing systems now, adding new CALS modules as necessary, rather than develop CALS modules around existing systems and then have to modify both to facilitate IWSDB usage.

The size and complexity of the IWSDB requires that development and implementation be closely managed to ensure adequate requirements development, testing, training, and integration throughout DoD. Any effort to standardize hardware, software, data, and telecommunications would simplify CALS improvements projects and IWSDB development, reducing development time and cost.

High-level management attention is needed to maintain a problem-solving focus, to prioritize projects, to allocate projects and funding among the Services, and to ensure coordination of multi-Service requirements and implementation. The ASD(P&L) and the Materiel Management Board (MMB) should pass their functional priorities to the Joint Logistics Systems Center for consideration in setting LCIM development priorities. The LCIM, in turn, should play an active role in coordinating any Joint-Service CALS projects and allocating resources as part of its overall systems management charter.

Supply Involvement in External CALS Initiatives

A number of external development efforts will have a direct effect on supply management. The degree to which these outside efforts provide benefits will depend greatly on how much influence supply management functional experts are able to exert on their development.

One of these external efforts is LCIM. As discussed above, LCIM efforts will result in increased standardization of supply data and systems. Closely coordinating supply management CALS improvements with LCIM actions can produce synergistic results: CALS improvements in supply management can improve the capabilities of the standard LCIM supply system while standard systems may simplify and lower the cost of CALS improvements.

Another external program is CE. CE uses combined teams of design, production, and logistics engineers to develop new weapon system designs. If CE is implemented widely, fewer DCNs will be generated during the development and production phases and increased supportability will be provided during the operational phase.

A third project is Product Data Exchange using STEP[1] (PDES). PDES will provide a complete digital record of an item, including descriptive and manufacturing information. If PDES is widely implemented, it will generate item identification data during the design process, thereby eliminating some of the work now done by supply catalogers. PDES could also reduce production lead times and inventory levels. Cataloging management personnel should become familiar with PDES development and make sure that cataloging requirements are met.

A fourth effort is CITIS. CITIS is a contractor-operated database of Government-owned data which would be available to a wide range of authorized users. With CITIS, a significant amount of the logistics data now delivered to the Government would instead be stored at the contractor's site; the Government would simply be given access to it. If CITIS is widely implemented, supply operations would need to use more telecommunications to access data needed from CITIS databases.

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[1]STEP is an international product definition standard. The English translation of STEP is Standard for the Exchange of Product Model Data.

CITIS would increase the speed, accuracy, and availability of technical data to the supply community.

Finally, development of the IWSDB architecture has begun. The IWSDB will encompass all information related to a given weapon system by integration of Government and contractor databases into a single logical database. Data would be input one time and would be maintained at its point of entry, where it would be available for access by all other users. Logistics data and the source data needed to make logistics decisions would be included in the IWSDB. Functional input is required from the supply community to ensure that all necessary data are included in the IWSDB and that they are structured to facilitate typical data queries and reports. Supply management personnel need to quickly define the supply requirements that should be considered in the design of IWSDB and to communicate them to the developers.

POLICY CONFLICT

Various legal, political, and economic factors govern the relationship between the Government and its contractors, which are meant to be much more "arms length" than those between private-sector firms. The advent of CALS and its database integration will alter this arms-length relationship. The Government and its contractors will need to work closer in the CALS shared-data environment. Whether existing restrictions on Government and contractors will be loosened is a question that should be addressed early. There is no point in investing resources in CALS capabilities, especially CITIS and IWSDB, if the working environment does not allow their use.

The control-of-data issue created firm resistance from both Government and contractor personnel to various aspects of the IWSDB concept. Some Government personnel, for example, are very reluctant to trust contractors to retain data that are now delivered to the Government. On the other hand, some contractor personnel are hesitant to provide the Government with proprietary technical data out of concern for security of the data. The benefits of an integrated database decrease in proportion to the extent that either side insists on separate databases for control purposes.

Other policy decisions may be required either to take full advantage of CALS capabilities or to limit development of capabilities that would not be used for policy reasons. One example is the potential for planned changes in operations/training

tempo and maintenance activity to be fed directly into the supply system to make it more responsive. The technical capability to feed planning data to the supply system in a CALS environment is not difficult, but deliberate policy decisions are required to make the planning data available to the supply community (or perhaps to make it available in a new way) and to determine how the supply system should use it.

Another example of policy decisions affecting CALS development is the extent to which DoD will use nondevelopmental items (NDIs) in its weapon systems acquisitions. Much of the benefit to be derived from CALS comes from improved exchange and management of data during weapon system development. If NDI were to be used extensively, the amount of DoD-contracted development would be less, the benefits from CALS would be less, and certain CALS capabilities might no longer be cost-effective.

Computer-Aided Acquisition and Logistics Support will make information available that can improve the supply management process and may alter its relationship with other organizations. Decisions in these policy areas are needed before the full scope of CALS improvements can be finalized.

CULTURAL CHANGE

A basic cultural change needs to take place in the work force in order for CALS to be used effectively. The transition to a paperless office environment is threatening to those who have not been exposed to computer applications. Training and indoctrination programs will be needed at every level to ensure the eventual success of this transition.

Functional personnel who will provide input to LCIM, CE, PDES, CITIS, IWSDB, and other development efforts must be trained soon to fully understand the implications of CALS technology for their operations, the full range of potential improvements that CALS offers, and the input and output data requirements for the development projects.

Before CALS improvements are implemented, all functional personnel should be given every opportunity to increase their "computer literacy" through training and hands-on use of computer equipment.

RECOMMENDATIONS

We recommend that the ASD(P&L) take the following actions to introduce CALS into the supply process in the most efficient manner:

- *Direct the ASD(P&L) Logistics Systems Development Directorate and the Joint Logistics Systems Center to:*
  - *Establish functional CALS implementation priorities for LCIM planning.* Since resource constraints will require a phased CALS implementation for supply management, functional priorities should influence which CALS capabilities are implemented first. We recommend that first priority should be given to CALS projects that minimize the amount of inapplicable assets in the inventory by speeding up the provisioning process so provisioning can begin later in the acquisition cycle, when designs are more stable. A second priority level should be those CALS projects that allow the supply system to have faster access to data it needs from suppliers and using units. A third priority level should be those CALS projects that otherwise improve the productivity of essential supply functions.
  - *Develop a plan for changing the supply system infrastructure.* The shift from paper-based to digital data requires investment in new data storage and display capabilities in supply facilities (e.g., optical disk storage, improved data retrieval and management information software, graphics workstations). Additional telecommunications needs (e.g., dedicated phone lines, greater line capacity) must be identified and forwarded to telecommunications planners. Also, as supply management processes change, job descriptions will need to be revised and changes in the quantity and skills required of the work force should be anticipated. These collateral changes are essential to the success of CALS improvements and should be considered an integral part of the transition.
  - *Develop a transition plan for implementing CALS supply projects.* Appendix F contains LMI's proposed framework for such a plan.
- *Work closely with LCIM and other system consolidation/standardization/modernization programs to ensure CALS-related supply improvements are considered.* Actively encourage improvements to the supply system through the LCIM using CALS technology.
- *Direct OSD/lead Service functional participation in related technology initiatives outside supply management such as CE, PDES, CITIS, and IWSDB to ensure that these technologies fully support supply system CALS initiatives.* Provisioning personnel should participate in CE and CITIS

development. Cataloging personnel should participate in PDES development. LSA personnel should participate in IWSDB development.

- *Identify policy issues that will affect (or be affected by) CALS implementation and seek resolution with OSD counterparts with policy-making authority.* Procurement issues regarding changing DoD/contractor relationships in a shared-data environment, the degree of emphasis on NDIs and technical data rights should be raised with the Under Secretary of Defense for Acquisition. Also, innovative projects to improve supply system effectiveness may require access to operations and maintenance planning data or require data feedback from using units which are not routinely provided today. Policy decisions will be required to determine what data will be acquired and how it will be used.

- *Direct the Joint CALS Management Office to develop CALS training/indoctrination programs for the supply community.* Incorporate CALS into formal supply school curricula and establish a network of CALS focal points throughout the supply system.

APPENDIX A

BACKGROUND ON THE CALS PROGRAM

By the early 1980s, manufacturers in competitive high-technology markets were launching products faster and cheaper by taking advantage of computers to prepare design and manufacturing data in digital form. This required that industry invest heavily in computer-aided design and computer-aided manufacturing (or CAD/CAM) equipment. They also began to digitize support information for faster update and distribution. By the mid-1980s, many firms had the capability to design and build major weapon systems from scratch without putting pencil to paper.

Meanwhile, DoD remained heavily committed to the paper world. The Government required contractors to break their integrated digital data into paper deliverables for Government review. Not only did contractors have to put it all on paper, they sometimes had to do it as many as three or four different ways to satisfy format and content requirements of each of the Services. As computerization expanded, the Government automated some of its functions. Unfortunately, the lack of standards for either industry or Government limited the ability of these systems to communicate with one another, leading to "islands of automation" that could not be easily bridged.

When it became clear that several Government and industry organizations were developing different systems to perform the same functions, the idea of Computer-Aided Acquisition and Logistics Support (CALS) was conceived. In the near term, CALS will act as an umbrella program to promote the sharing of project information between developers and to develop information exchange standards to bridge the islands of automation. Adherence to CALS standards began to appear as a requirement of request for proposals (RFPs) for weapon systems in 1988.

In the long term, CALS will provide an integrated database with digital access to all information relevant to a weapon system. This integration of data is expected to lead to integration of the acquisition, design, manufacturing, and support activities who use that data.

The basic CALS strategy is to move first from paper to common digital data interchange standards to allow existing systems to communicate. Eventually, all weapon system databases will share data through the Integrated Weapon System Database (IWSDB).

Supply management stands to gain much from CALS. Electronic documents can be transferred, reviewed, and revised much faster than paper documents. This will make reviewers and revisers more productive and reduce coordination cycle times. Development of digital product definition data will allow direct input to a manufacturer's CAD/CAM and numerical control production equipment, reducing production lead times. This, in turn, will lead to less inventory and a more responsive logistics support system. Although less tangible, data integration should allow designers to create weapons that are easier to maintain, improving both availability and readiness. Industry will also gain through reduced costs for preparation of deliverable data and the higher quality designs made possible by integrated data bases.

CALS time phasing calls for standards, systems upgrades, and demonstration projects based on state-of-the-art technology to be implemented by 1995. Integration of databases and functions form a long-term phase that will depend on the development of new technology for the operation of distributed data bases.

A September 1988 memorandum from the Deputy Secretary of Defense (DEPSECDEF) required the Services to use CALS in weapon system contracts and to upgrade their information systems to process the new CALS deliverables. MIL-HDBK-59 provides weapon system program managers (PMs) with guidance for incorporating CALS-compliant data delivery in contracts.

Future requests for proposals (RFPs) can be expected to place more emphasis on CALS in source selection criteria. In addition to paperless data delivery, the content of the deliverables can be expected to change as data base integration continues.

CALS PHASE I INITIATIVES

Existing CALS Standards

CALS standards already exist for digital exchange of text and various forms of graphics. There is also a commercial standard for querying databases. These standards are all fully coordinated with related international standards.

Commercial CALS products are now on the market that were developed to these standards. The CALS Test Network (located at Wright-Patterson Air Force Base) is charged with testing these standards. Commercial vendors voluntarily submit their CALS products to the Test Network for evaluation.

Standards Under Development

Additional standards are under development that will take advantage of recent and future technological advances. One of the most significant of these is Product Data Exchange using STEP[1] (PDES). STEP is an international product data standard with which PDES will comply. PDES will guide the capture of CAD/CAM and other descriptive data about products within an integrated data base and will allow transfer of that descriptive data directly into CAD/CAM design equipment and numerical-control manufacturing equipment. This should shorten procurement lead times.

Product Definition Data

While PDES is the ultimate goal for product definition data, most products today are defined on engineering drawings that are stored either in hard copy or on microfilm aperture cards. Under CALS Phase I, drawings will be digitized, and storage and retrieval will be automated. Because of current telecommunications limitations, digital drawings will continue to be mailed on tape or optical disk for some time. Eventually, entire technical data packages will be digitized and distributed electronically.

In CALS Phase II, PDES will replace engineering drawings and cataloging data with a comprehensive three-dimensional digital representation plus all additional production process information necessary to manufacture the item. Including logistics information in the PDES model is also being considered. If logistics information is added, all information necessary to produce and maintain the product will be in a single, integrated data base that could be accessed by any computer system. This information would be maintained on the contractor's data base and would allow electronic access by the Government and any other authorized user. It would also be a central component of the IWSDB.

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[1]STEP is an international product definition standard. The English translation of STEP is Standard for the Exchange of Product Model Data.

Among CALS active product definition projects area are automation of drawing repositories, automated manufacturing of small parts using PDES-type data, and digitization of large hard-copy files like shipboard design data.

Technical Manuals

Technical manuals (TMs) will evolve like engineering drawings have. Paper TMs will be digitized on optical disk for display on desktop or portable computers. During Phase I, these digital displays will continue to show page-oriented information.

In Phase II, the "pageless tech manual" will come into being. In this concept, text and graphics will be stored as blocks of data in a data base. The relationships between these blocks of data will also be recorded. When a mechanic requests information on brakes, for example, the system will automatically retrieve relevant text and graphics from the IWSDB. The information retrieved could include a parts list, an assembly drawing, an item identification, and the repair procedure. This process will make revised information available to users sooner and will present users only with that information relevant to the task at hand.

Among several projects active in the TM area are conversion of technical documentation to optical disk, improved management of TM revisions and distribution, and development of CALS-compliant TMs for selected weapon systems.

Integrated Logistics Support Data

CALS will change Logistics Support Analysis (LSA) provisioning data, too, from its current hard-copy, fixed-format reports, or 80-column, punch-card format. In Phase I, LSA records will be stored in relational data bases to allow more flexible output. On-line inquiry and update of LSA records will also be possible, increasing the influence that LSA data will have on weapon system design decisions. Under Phase II, LSA data will be incorporated in the IWSDB.

CALS LSA projects include a number of on-line contractor LSA systems and a microcomputer system for interactive provisioning data exchange.

Systems Modernization

Government data processing and telecommunication systems must be upgraded to store, process, and transmit digital data. Upgrades include automated, digital

drawing repositories, optical disk drives, graphics terminals, and higher capacity communication lines.

Specifications are being developed for Contractor Integrated Technical Information Service (or CITIS) that will become contractor-maintained data bases of Government-approved weapon system data available to authorized Government and industry users. With CITIS, much weapon system data can be accepted by the Government as part of the contractor-maintained database without ever being physically delivered to the Government.

LONG-TERM CALS INITIATIVES

Integrated Weapon System Data Base

The IWSDB, a long-term CALS goal, places all data relevant to a weapon system in a single logical database. To the typical user of the IWSDB, all the data will appear as if they were stored within their own computer systems. The fact that data may be retrieved from many different data bases in many different locations will be invisible. The intent of the IWSDB is to store data where they are created and maintained and make them available to all authorized users.

After achieving this high level of integration, each piece of data will only have to be entered once in one place, and several users will be able to access the same data at the same time. This will allow sequential processes to be accomplished simultaneously. Users will not have to wait while data are passed from one process to the next. The IWSDB will make information available to all processes as it is created. Logistics tasks, like provisioning, that are now done in sequential steps can be done simultaneously, reducing the time needed to develop spares support for a new weapon system. The greater availability of Government and industry-shared data using the IWSDB concept will also ease the transition of supply support from the contractor to the Government. CALS Phase II will reduce support lead times and lower support costs.

Concurrent Engineering

Traditionally, weapon systems have been designed with little input from production or logistics engineers. As a result, when a design moved to manufacturing, many engineering changes were required to achieve economical, high-rate production. By the time the logistics engineers finally got a look at the

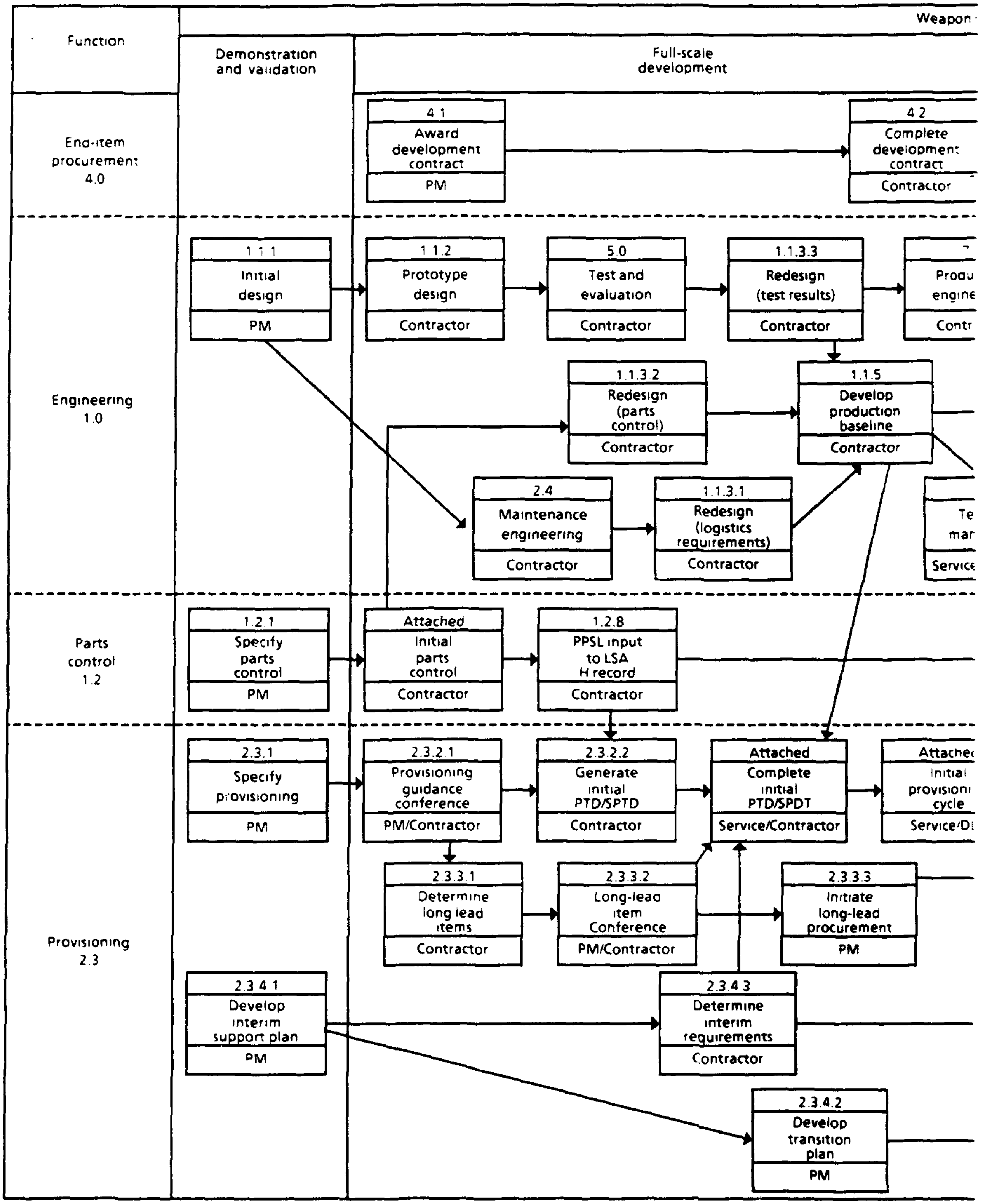
design, supportability trade offs were made in favor of performance or producibility. This led to higher operating and support costs in the field and higher total life-cycle costs.

Concurrent engineering (CE) means that design, production, and logistics engineers work as a team to incorporate production and logistics requirements during initial design, which leads to a higher quality, lower cost system. The IWSDB will contribute to CE by helping to identify the effect of various design alternatives on production and support.

APPENDIX B

LOGISTICS PROCESS WORK BREAKDOWN STRUCTURE

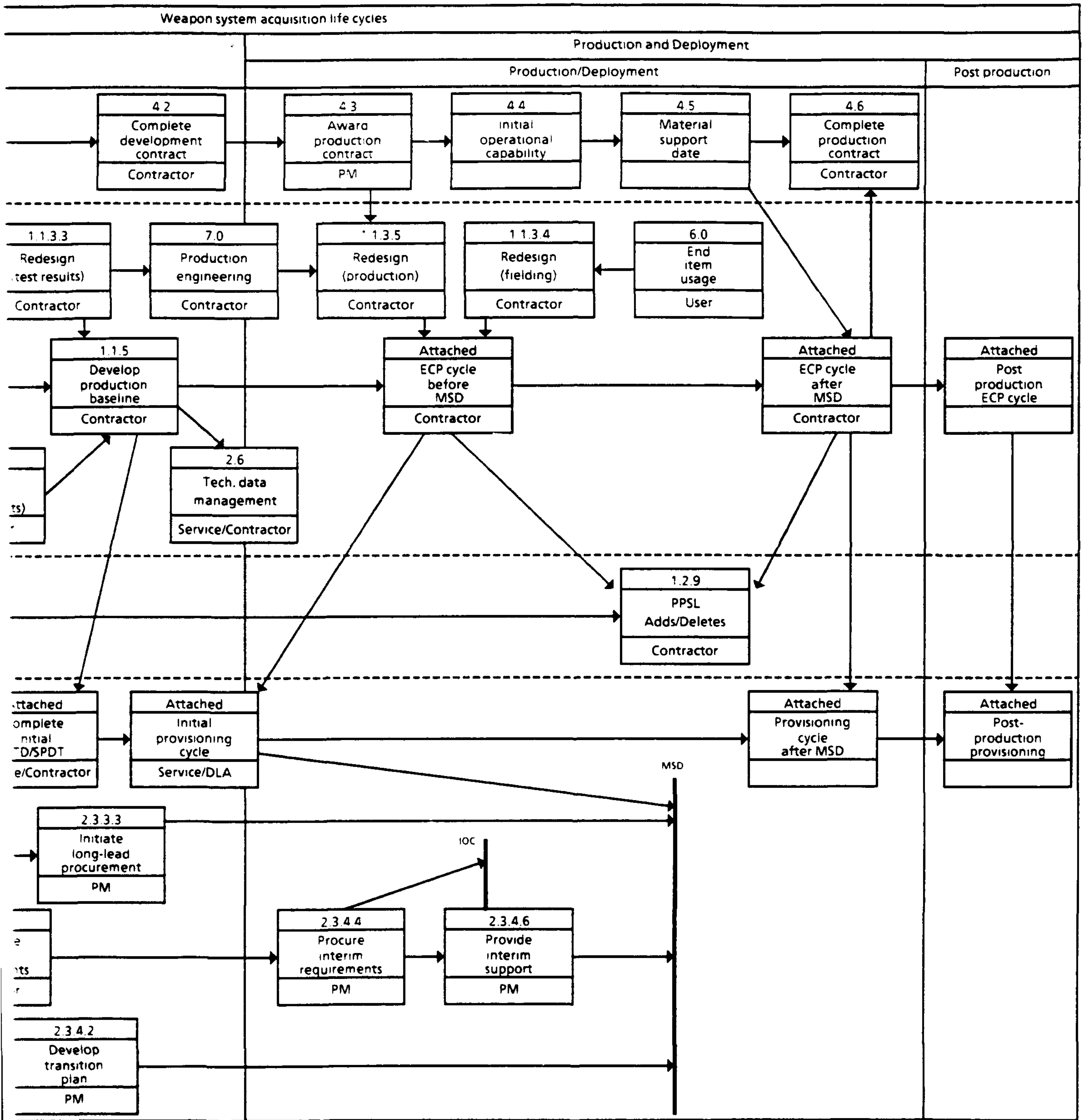
This appendix contains process diagram charts that we developed to describe the current steps that are taken to provide supply support for a new or modified weapon system. The processes are shown in Figures B-1 through B-5. Each process block contains a work breakdown structure (WBS) code, the name of the process, and the organization responsible for the process. Table B-1 describes each process, in WBS sequence.



Notes: PM = program manager
LSA = logistics support analysis
PTD = provisioning technical documentation
SPTD = Supplemental Provisioning Technical Documentation
DLA = Defense Logistics Agency
ECP = engineering change proposals
MSD =
IOC =
PPSL =

FIG. B-1. INTRODUCTION OF NEW PARTS INTO T

(1)



ocumentation

MSD = material support date
IOC = initial operational capability
PPSL = Program Parts Selection List

ION OF NEW PARTS INTO THE SUPPLY SYSTEM – CURRENT PROCESS

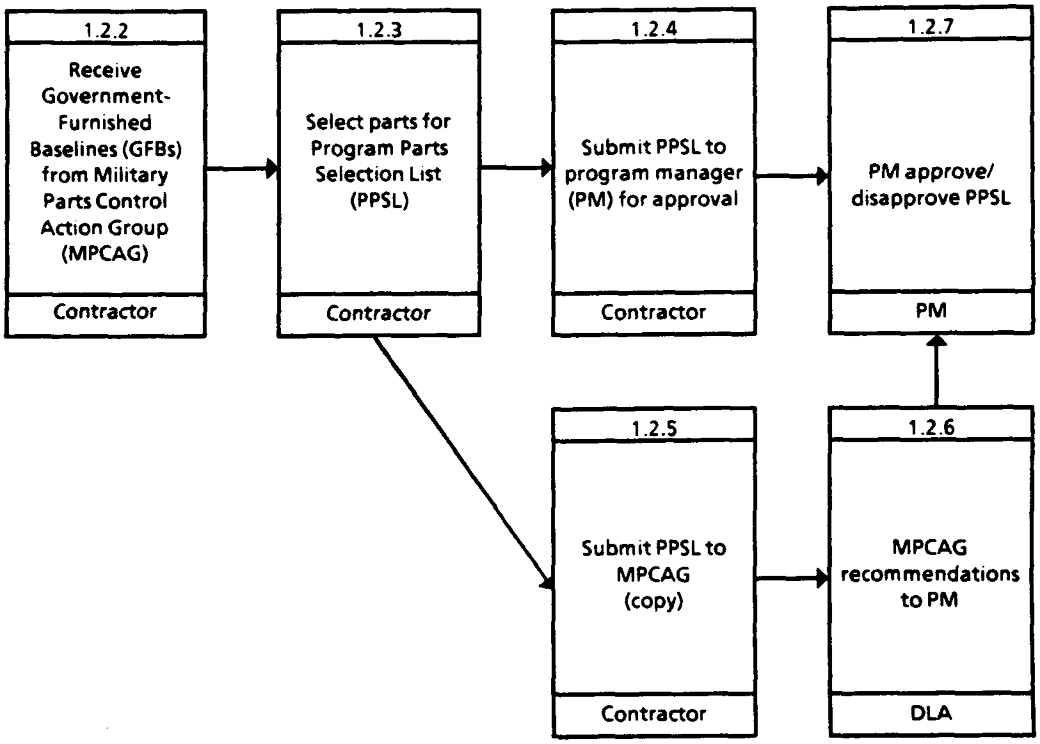


FIG. B-2. INITIAL PARTS CONTROL

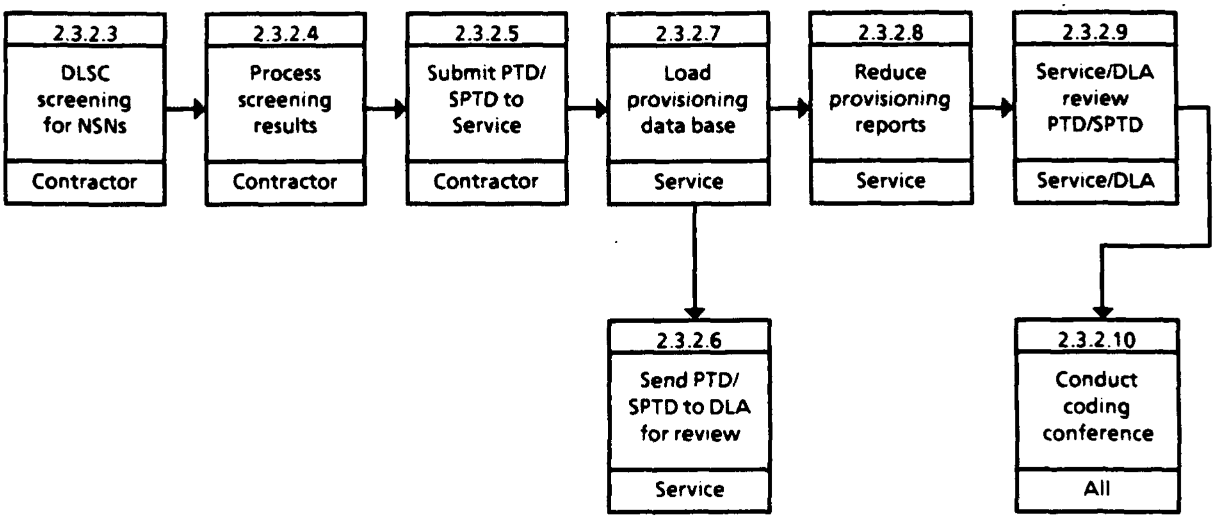


FIG. B-3. COMPLETE INITIAL PROVISIONING TECHNICAL DOCUMENTATION/SUPPLEMENTAL PROVISIONING TECHNICAL DOCUMENTATION

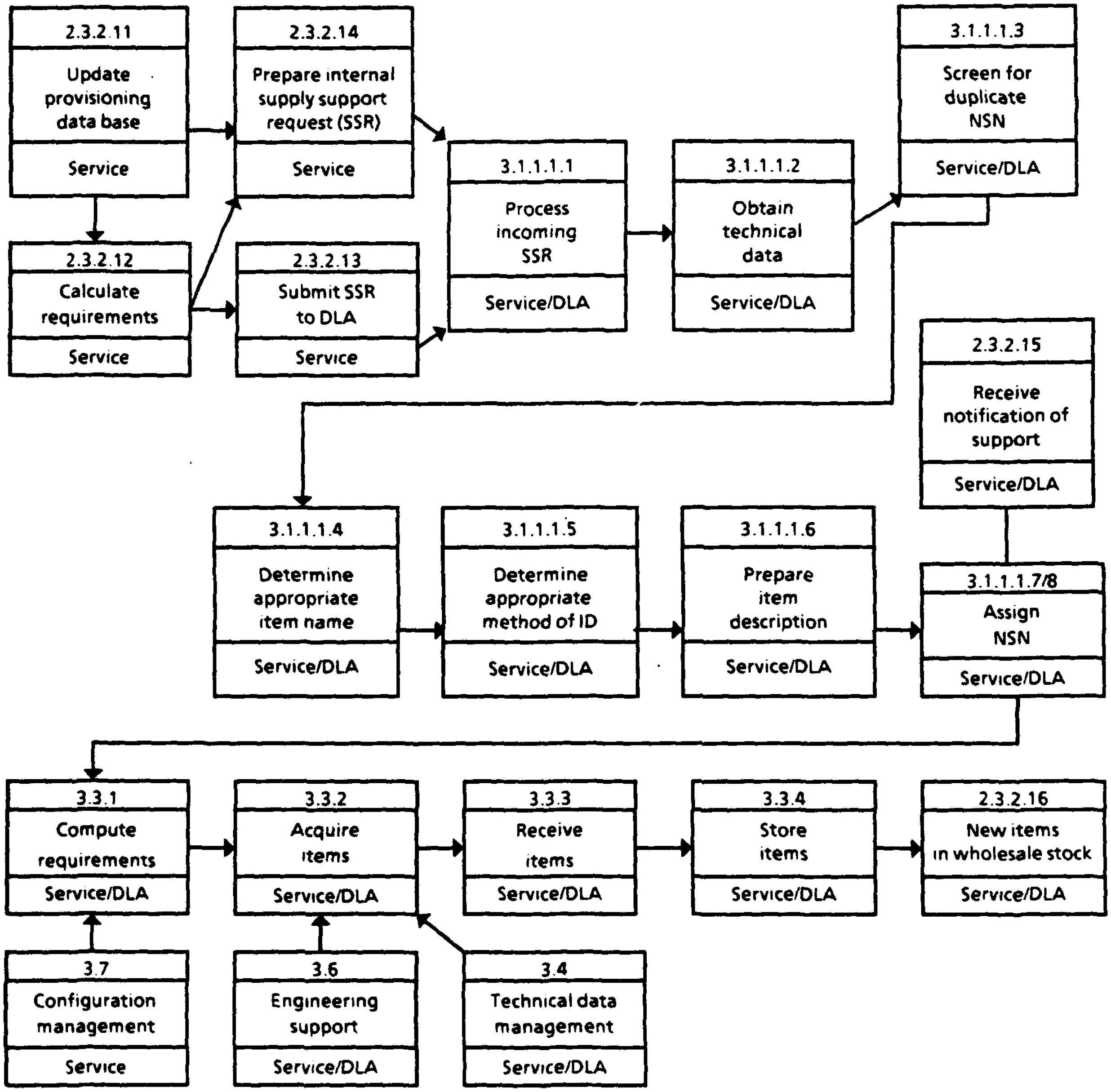


FIG. B-4. PROVISIONING CYCLE

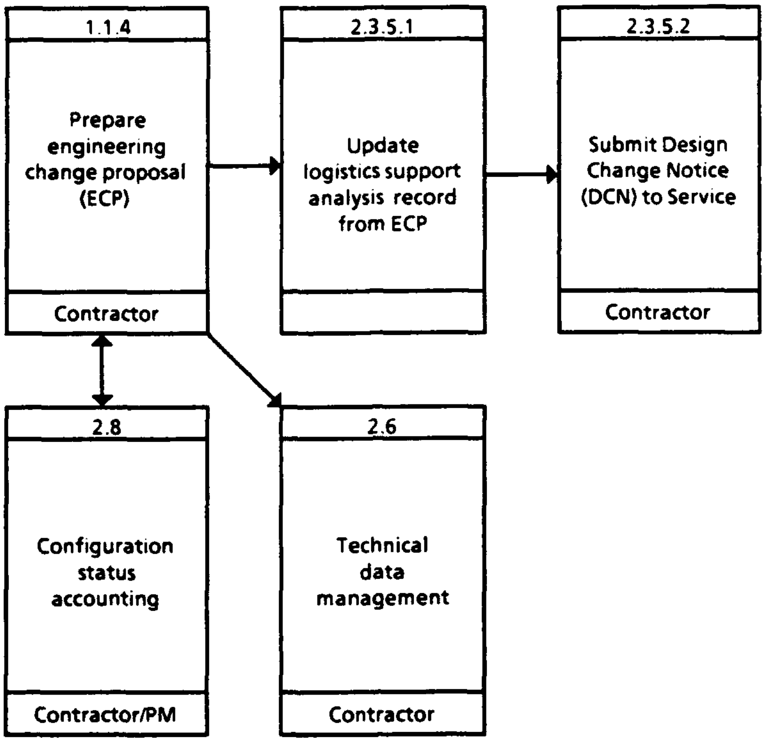


FIG. B-5. ENGINEERING CHANGE PROPOSAL CYCLE

TABLE B-1

LOGISTICS PROCESS WORK BREAKDOWN STRUCTURE

Indenture level					Function
1	2	3	4	5	
1.0					Engineering
	1.1[a]				Design engineering
		1.1.1			Initial design The initial design requirements are developed in parallel with the mission profile and are completed before entering the full-scale development (FSD) phase.
		1.1.2			Prototype design The FSD contractor must design a prototype system that meets all of the initial design requirements. Emerging designs are repeatedly subjected to tests, evaluations, and trade off analyses until optimized.
		1.1.3[a]			Redesign
			1.1.3.1		Redesign (logistics requirements) The weapon system design may require change based upon logistics considerations, including life-cycle costs. Integrated logistics support analyses are performed to determine the effects of a design on supportability, logistics resource requirements, and life-cycle costs for the purpose of reducing any adverse effects.
			1.1.3.2		Redesign (parts control) Designers must use standard parts to meet design requirements or justify the use of nonstandard parts. A Program Parts Selection List (PPSL) is developed and maintained to control the use of nonstandard parts. The design may be changed to increase the use of standard parts and/or decrease the use of limited supply items.
			1.1.3.3		Redesign (test results) Weapon system design and operational tests are performed in the early stages of development. The results of these tests are used to evaluate and improve the design. As the design matures, operational tests are conducted to ensure that the weapon system as a whole will perform satisfactorily.
			1.1.3.4		Redesign (fielding) Feedback from operational units in the early stages of fielding results in design changes to correct deficiencies or improve performance.

[a] Not shown on process charts.

TABLE B-1

LOGISTICS PROCESS WORK BREAKDOWN STRUCTURE (Continued)

Indenture level					Function
1	2	3	4	5	
			1.1.3.5		Redesign (production) In the absence of concurrent engineering (where design, production, and logistics engineers develop an end item as a team), the prototype design may need to be changed to accommodate high-rate production processes. Production engineering and planning should be integral elements of the design process to minimize the amount of redesign required for production.
		1.1.4			Prepare ECPs ECPs are prepared and submitted to the Government for approval once the production baseline has been established. A formal configuration control system is used to manage the process. The number of design changes is an important indicator of both the quality of the initial design and the degree of stability achieved in the overall design. Frequent design change reduces the ability of the supply system to provision spares effectively for the as-fielded configuration.
		1.1.5			Develop production baseline Once a prototype system has been successfully produced and tested, the production baseline is established. This baseline is used to enter into full-scale production. Any design changes needed after the baseline has been set must enter the formal configuration control process.
		1.1.6 [a]			Complete production drawings Completed production drawings form the basis of the technical data package (TDP) that is delivered to the Government. It is used for the next procurement of the end item as well as subsystems, assemblies, and piece parts.
	1.2				Parts control/standards engineering Standards engineering controls the materials, parts, and processes used in design in order to improve design quality, reduce design complexity, and reduce manufacturing costs. The selection of material, including parts and components, has a tremendous effect on the producibility and supportability of an end item. This highly iterative process has many decision points, each of which permits a potential tradeoff against some other requirement. Each demand upon the completed end item design, such as reliability, availability, maintainability, safety, or producibility, heavily interacts with the others throughout the design process and creates the need for tradeoffs. Use of standard parts wherever possible reduces the time and cost of system design and reduces long-term support costs by minimizing the total number of parts managed by the supply system. To control the spare parts, DoD has a formal parts control program.

[a] Not shown on process charts.

TABLE B-1

LOGISTICS PROCESS WORK BREAKDOWN STRUCTURE (Continued)

Indenture level					Function
1	2	3	4	5	
		1.2.1			Specify parts control DoD policy requires mandatory application of parts control at the outset of full-scale development; invoking MIL-STD-965A on the contract applies parts control.
		1.2.2			Receive GFBs from MPCAG Government-Furnished Baselines (GFBs), lists of preferred standard parts to be used as an aid in selecting parts during design, are maintained by the Military Parts Control Action Groups (MPCAGs) located at four DLA supply centers.
		1.2.3			Select parts for PPSL A Program Parts Selection List (PPSL) is prepared by the design contractor and approved by the Government. The list contains each part, both standard and nonstandard, that the contractor intends to use in the design.
		1.2.4			Submit PPSL to PM for approval The initial PPSL and later changes must be approved by the Services' program office responsible for the acquisition. The MPCAGs provide recommendations that are either accepted or rejected.
		1.2.5			Submit PPSL to MPCAG (copy) The PPSLs are processed by the MPCAG who screen the nonstandard parts requests. Items requiring new technologies may become candidates for inclusion on a GFB. When this occurs, technical data in the form of draft specifications may be procured. For other items, MPCAG screening may recommend a standard part be substituted.
		1.2.6			MPCAG recommendations to PM The MPCAG forwards recommendations for approval or disapproval, along with requests for additional data to the PM for action.
		1.2.7			PM approve/disapprove PPSL The PM, based upon the MPCAG review, must formally approve or disapprove the contractor's proposed PPSL. Only those items that appear on the approved PPSL may be used in the evolving weapon system design.
		1.2.8			PPSL input to LSA H record Data element in the LSA H record for each specific part indicates whether the part is included on the PPSL.
		1.2.9			PPSL adds/deletes Once the initial PPSL has been approved, any additions/deletions must also go through the formal approval process.

TABLE B-1

LOGISTICS PROCESS WORK BREAKDOWN STRUCTURE (Continued)

Indenture level					Function
1	2	3	4	5	
2.0[a]					Integrated logistics support The acquisition process fields weapon systems and equipment that not only perform their intended functions, but are ready to perform these functions when called on, and to do so over and over again without unplanned maintenance or logistics support. LSA is used throughout the acquisition process to evaluate design approaches and alternative support concepts to achieve system readiness and support objectives, and to develop the detailed support system design.
	2.1[a]				Technical Manuals (TMs) documentation Clear and concise TMs that match the production configuration of the equipment are critical to supportability. Deficiencies cause delays in operational testing, low readiness rates, increased revision change activity, and increased spares and data costs. Inadequate provisioning technical data frequently limit competition, acquisition flexibility, and spares manufacturing throughout the life cycle.
	2.3				Provisioning Provisioning is the management process of determining and acquiring the range and depth of support items necessary to operate and maintain an end item of materiel for an initial period of service. The identification and procurement of spare parts are essential to weapon system supportability. Full spares provisioning too early in the development cycle, when there are large uncertainties in the predicted failure rates and design stability, results in the procurement of too many or too few spares. Poor provisioning can greatly increase the acquisition and support costs and reduce the readiness of fielded systems.
		2.3.1			Specify provisioning Provisioning Technical Documentation (PTD) is procured from the design and production contractor by invoking MIL-STD-1561B, *Uniform Department of Defense Provisioning Procedures*, and MIL-STD-1388-2B, *DoD Requirements for a Logistic Support Analysis Record,* on the contract. A Provisioning Performance Schedule (PPS) is included.
		2.3.2[a]			Provisioning for MSD The material support date (MSD) is the date when the initial provisioning assets have been procured and are available at wholesale inventory stock points to support user demands.
			2.3.2.1		Provisioning Guidance Conference The purpose of this conference is to ensure that the contractor and the Government have a firm understanding of the contractual provisioning requirements, establish funding and task milestones, and formulate firm commitments for optional requirements.

[a] Not shown on process charts.

TABLE B-1

LOGISTICS PROCESS WORK BREAKDOWN STRUCTURE (Continued)

Indenture level					Function
1	2	3	4	5	
			2.3.2.2		Generate initial PTD and SPTD The data required to produce PTD is input into the LSAR as the design matures. The reliability [mean time between failure (MTBF) data in the form of failure rates], and level of repair (in the form of maintenance codes) of individual assemblies, components, and parts are recorded in the LSAR and must be supportable and in compliance with the end-item performance specifications. The building of the LSAR takes place during the entire full-scale development phase and culminates with the delivery of provisioning parts lists (PPLs) to the Government.
			2.3.2.3		DLSC screening for NSNs The reference numbers of proposed new items of supply as screened against the database of all existing NSNs to determine whether an NSN already exists for the item. If included in the contract, the contractor performs screening by forwarding screen requests to DLSC in the formats required by DoD 4100.38M, ***DoD Provisioning and Other Preprocurement Screening Manual.***
			2.3.2.4		Process screening results DLSC transmits the results of screening back to the contractor who then enters the results into the LSAR.
			2.3.2.5		Submit PTD/SPTD to Service On the date required in the contract, timed to coincide with the establishment of the production baseline, provisioning lists in the form of hard-copy reports, punched cards, or magnetic tapes are delivered to the Government. SPTD – technical data in the form of drawings, specifications, photographs, sketches, etc. – is also submitted when required to provide the physical functions and characteristics needed for cataloging. Within 30 days after receipt, the Government must provide the contractor with notification of conditional acceptance or nonacceptance.
			2.3.2.6		Send PTD/SPTD to DLA for review In preparation for the provisioning coding conference, the DLA lead supply center is provided with an advance copy of the PTD package. DLA representatives are invited to the conference to discuss deficiencies found with the PTD and to assist with the assignment of management codes.
			2.3.2.7		Load provisioning database The Service loads the provisioning database at the lead inventory control point (ICP). Input techniques range from keypunch from hard-copy lists to automatic processing of LSAR-produced magnetic tapes. At some ICPs, the data are preprocessed by front-end software prior to data load.

TABLE B-1

LOGISTICS PROCESS WORK BREAKDOWN STRUCTURE (Continued)

Indenture level					Function
1	2	3	4	5	
			2.3.2.8		Produce provisioning reports Once loaded, the Service system produces provisioning reports that are used at the provisioning coding conference.
			2.3.2.9		Service/DLA review PTD/SPTD Prior to the conference, the provisioning reports are reviewed by both the Service and DLA, discrepancies are noted, and questions are prepared.
			2.3.2.10		Conduct provisioning coding conference At this conference, the Government selects support items and assigns technical and management codes.
			2.3.2.11		Update provisioning database At the completion of the conference, the Service files are updated to reflect the decisions made.
			2.3.2.12		Calculate requirements Based upon the finalized PTD, as reflected in the Service database along with end-item density data, the Services calculate support item requirements. Allowance lists (range and depth of support items to be provided with the equipment to the user activity) are produced along with initial wholesale stocking levels. These requirements are derived from readiness-based sparing models that rely on the forecasted failure rates contained in the PTD. The wholesale stock levels are in effect for a period of 2 years; after that time, actual demand history is used to set stockage levels. DoD Instruction 4140.42, ***Determination of Requirements for Spare and Repair Parts Through the Demand Development Period,*** is the governing policy.
			2.3.2.13		Submit SSR to DLA For items that were assigned item management codes (IMCs) indicating that DLA will be the integrated material manager (IMM), the Service submits an SSR along with the applicable technical data to the DLA supply center responsible. The SSR indicates initial support requirements, both wholesale and retail, and gives the required material support dates. The policy and procedures for this are contained in DoD 4140.26-M, ***Defense Integrated Material Management Manual for Consumable Items.*** SSRs are submitted via automatic digital network (AUTODIN), but the technical data are sent by mail.
			2.3.2.14		Prepare internal SSR For all reparable items (nonconsumable items) and other items with an IMC assigning their management to the Service, some form of internal SSR is used to establish support quantities and dates.

TABLE B-1

LOGISTICS PROCESS WORK BREAKDOWN STRUCTURE (Continued)

Indenture level					Function
1	2	3	4	5	
			2.3.2.15		Receive notification of support After acceptance by DLA, the Services are informed of the dates by which support will be available. If these dates do not meet the dates required on the SSR, some form of interim support may be necessary. A similar process takes place within the Service for Service-managed items.
			2.3.2.16		New items in wholesale stock Initial provisioning items have been procured, received, and stored and are available to satisfy user demands.
		2.3.3[a]			Provisioning long-lead items
			2.3.3.1		Determine long-lead items Long-lead items are those items that, because of their complexity of design, complicated manufacturing process, or limited production capacity, would cause delays and prevent timely or adequate delivery if not ordered in advance of normal provisioning.
			2.3.3.2		Conduct long-lead item conference At this conference the government reviews and selects the long-lead items required to support the end item.
			2.3.3.3		Initiate Long-Lead Procurement Long-lead item procurements are initiated in advance of the normal provisioning procurement process.
		2.3.4[a]			Provisioning for interim support Some acquisition program schedules require that the equipment be fielded before the MSD occurs, because some form of interim support must be established. For these programs, the prime contractor is often relied upon to provide it.
			2.3.4.1		Develop interim support plan Critical to the success of interim support is a well-thought-out, tailored interim support plan. Often, interim support is provided on an *ad hoc* basis especially for programs that fall behind schedule. Both the number of programs requiring interim support and the average length of interim support periods have grown in recent years for many reasons. One cause is the increased use of nondevelopmental items (NDIs) and streamlined procurements which field systems earlier, while the provisioning cycle remains the same. Another is the growth in weapon system complexity and the use of advanced technologies that prolonged design instability.

[a] Not shown on process charts.

TABLE B-1

LOGISTICS PROCESS WORK BREAKDOWN STRUCTURE (Continued)

Indenture level					Function
1	2	3	4	5	
			2.3.4.2		Develop transition plan Of equal importance to the success of an interim support period is a carefully constructed transition plan. The smooth shift from contractor support to Government support requires close coordination among several activities. The transfer of responsibility, data, and material must all be carefully orchestrated to avoid lapses in support and confusion to the user.
			2.3.4.3		Determine interim requirements The contractor must recommend and the Government must select those support items for which interim support must be provided to the end-item user between the operational need date and the point in time when provisioning assets are available through the Government supply system. This is often done at a conference.
			2.3.4.4		Procure interim requirements Interim support item procurements are initiated in advance of the normal provisioning procurement process.
			2.3.4.5[a]		Receive interim support items Interim support items are received by the interim support stock points, usually the contractor, by the time the first system is fielded.
			2.3.4.6		Provide interim support Interim support will be provided until the material support date is reached, at which time transition will occur based upon the transition plan. Interim support instructions are provided to the users. Often, this consists of ordering items directly from the contractor using nonstandard ordering procedures.
			2.3.4.7[a]		Ship excess parts to ICP At the completion of the interim support period, remaining stocks in the contractor's possession will be transferred to Government stock points or will be otherwise disposed of.
			2.3.4.8[a]		Provide consumption data It is important that the demands recorded during the interim support period be loaded into the ICP files in order to be included in the stock-level computations that take place after the demand development period.

[a] Not shown on process charts.

TABLE B-1

LOGISTICS PROCESS WORK BREAKDOWN STRUCTURE (Continued)

Indenture level					Function
1	2	3	4	5	
		2.3.5[a]			Engineering change proposal (ECP)
			2.3.5.1		Update LSAR from ECP Approved ECPs are the source for design change notices (DCNs). After design release, design changes are recorded in the LSAR. DCNs are extracted from the LSAR.
			2.3.5.2		Submit DCN to Service As required by the contract, DCNs are submitted to the Government from the data entered into the LSAR along with new or revised technical documentation. DCNs must be submitted within 21 days after release for fabrication or procurement for prime contractor design items and 42 days for subcontractor-supplied items. For nonprocurable item DCNs, submittals must be within 60 days.
	2.4				Maintenance engineering The weapon system maintenance concept and plan affects the entire provisioning process directly. Level of repair analysis (LORA) must be conducted to separate the reparables from the consumables. A task and skills analysis helps select a suitable repair echelon for reparables. The results of these analyses are recorded in the LSAR. Additionally, the failure modes, effects, and criticality analysis (FMECA) and reliability predictions provide the data necessary for the peacetime and wartime failure rates and maintenance task distributions that must be recorded in the LSAR. If the results of these analyses reveal supportability problems, design tradeoffs may occur. All of these decisions affect the types and quantities of repair parts to be procured under initial provisioning.
	2.5[a]				Human engineering The weapon system designers must consider human constraints; in fact, human factors should always take precedence over other design considerations. The human is limited in arm span, grasp, and lifting and holding capabilities.
	2.6				Technical data management Technical data management includes all the activities required to acquire, store, retrieve, and distribute technical data needed to maintain and repair, procure, and manage inventories of both end items and components. For major end items, the technical data are usually acquired from the R&D contractor as contract deliverables.
	2.8				Configuration status accounting Configuration management (CM) is the set of activities required to effectively manage systems configuration. For the maintenance engineer, CM data are vital to ensure that correct parts are used in repair or replacement. CM data are vital to ensure that correct parts are ordered and in stock for maintenance. As parts change over time, timely CM control over DCNs allows supply operations to identify excess parts for disposal at the earliest possible time.

[a] Not shown on process charts.

TABLE B-1

LOGISTICS PROCESS WORK BREAKDOWN STRUCTURE (Continued)

Indenture level					Function
1	2	3	4	5	
3.0[a]					Weapon system support
	3.1[a]				Cataloging Cataloging consists of naming, classifying, describing, and numbering items of supply. Responsibility for technical research and item identification rests with the ICPs. It is basic policy of the Federal Catalog System that each item of supply be described and classified in such a manner that it is identified by a single stock number. The system encompasses all items subject to stockage for supply system support or subject to repetitive procurement, distribution, and issue.
		3.1.1[a]			Identify items
			3.1.1.1[a]		Control item entry Item entry control (IEC) is the process that ensures that each unique item has only one NSN. Includes technical writing, new item identifications, and includes all processes required from the time an SSR is received until the NSN is assigned. IEC includes screening all reference numbers, determining the appropriate item name, determining the Federal Supply Class (FSC), determining the appropriate method of item identification, and preparing the Federal Item Identification.
				3.1.1.1.1	Process incoming SSR The receipt of an SSR by the ICP via AUTODIN begins the IEC process. The procedures for processing SSRs are contained in DoD 4140.26-M, *Defense Integrated Material Management Manual for Consumable Items.*
				3.1.1.1.2	Obtain technical data The SPTD needed for IEC is forwarded separately to the ICP and must be matched to the appropriate SSR. SPTD is required for technical reviews of items, preparation of item identifications, and initial procurement. If not received with the SSR, the ICP may be required to obtain the needed technical data before proceeding.
				3.1.1.1.3	Screen for duplicate NSN Reference numbers of proposed new items of supply are screened against the database of all existing NSNs to determine whether an NSN already exists for the item. Screening includes screening data item descriptions (DIDs) characteristics to search for a duplicate or substitute item.

[a] Not shown on process charts.

TABLE B-1

LOGISTICS PROCESS WORK BREAKDOWN STRUCTURE (Continued)

Indenture level					Function
1	2	3	4	5	
				3.1.1.1.4	Determine appropriate item name The selection or development of a single item name for an item of supply creates a common language for material management operations and is the first step in the identification of an item. Approved item names are published in ***Cataloging Handbook H6***. The next step in the identification process is to select the appropriate FSC. The FSC is used to segregate like items into commodity groups and classes. The index of the FSC covers all items for which approved item names have been published. The FSC identifies the appropriate ***Federal Item Identification Guide*** (FIIG) to use to describe the item.
				3.1.1.1.5	Determine appropriate method of identification The appropriate method of identification, based upon the type of item, must be selected from among the following: Type 1 (Full descriptive): Item of supply is <u>not limited to a single specific item of production</u> and the identity of the manufacturer and his part number are not required as an integral part of the item identification. Type 1A (Full descriptive-reference): Item of supply is <u>limited to a single specific item of production</u> and the manufacturer and his part number are necessary elements of the item identification; sole-source procurement. Type 1B (full descriptive reference descriptive): Item of supply is <u>limited to a single specific item of production</u> and the manufacturer and his part number are necessary elements of the Item Identification; however, the manufacturer's part number is not single-item identifying and requires additional data to describe the item; sole-source procurement. Type 2 (reference): Item of supply is described only by a reference number and CAGE number. It is combined with a reference or partial descriptive method reason code (RPDMRC), a reference number category code (RNCC) that explains the relationship of the reference number to the item, and a reference number variation code (RNVC) that indicates the degree to which the number identifies the item. Type 4 (partial descriptive): Item of supply concept is the same as Type 1 but cannot be described fully. Type 4A (partial descriptive-reference): Item of supply concept is the same as Type 1A but cannot be fully described. Type 4B (partial descriptive-reference-descriptive): Item of supply concept is the same as Type 1B but cannot be described fully.

TABLE B-1

LOGISTICS PROCESS WORK BREAKDOWN STRUCTURE (Continued)

Indenture level 1	2	3	4	5	Function
				3.1.1.1.6	Prepare item description The FIIGs establish and support a mechanized logistics data system to record item descriptive data. Each FIIG lists the required and optional characteristics data fields that must be entered. Item identifications are prepared in accordance with the DIDs procedures manual.
				3.1.1.1.7	Transmit description to DLSC The item description is transmitted to DLSC for validation and NSN assignment. The data are entered into the DIDs database.
				3.1.1.1.8	DLSC assigns NSN NSN assignment is controlled by DLSC.
				3.1.1.1.9[a]	Provide notification of support The results of SSR processing, including offers of substitutes, are transmitted back to the Service. The procedures of DoD Manual 4140.26-M, ***Defense Integrated Material Management Manual for Consumable Items,*** are used.
			3.1.1.2[a]		Determine item I&S Studies are conducted of like items in an FSC to determine interchangeability and substitutability (I&S) relationships between them. These relationships are used to offer substitute items for issue and to eventually reduce the number of items by establishing a few preferred items that have a wide range of use.
			3.1.1.3[a]		Conduct item reduction Items are reviewed by FSC to systematically determine whether stock numbers can be canceled because of obsolescence, exact or functional duplication of other items, lack of demand, or other legitimate reasons.
		3.1.2[a]			Maintain total item records The total item records process maintains an NSN record in DIDs, including revisions of data and deletions of records.
		3.1.3[a]			Coordinate logistics reassignments Logistics reassignments are the transfer of material management responsibilities from one material manager to another. The policy and procedures for logistics reassignments are contained in DoD Manual 4140.26-M, ***Defense Integrated Material Management Manual for Consumable Items.***
		3.1.4[a]			Distribute/publish total item record (TIR) data Distribute/publish TIR data is the process of publishing documents for the users of the cataloging system, including the extraction of data to respond to specific requests from users.

[a] Not shown on process charts.

TABLE B-1

LOGISTICS PROCESS WORK BREAKDOWN STRUCTURE (Continued)

Indenture level					Function
1	2	3	4	5	
	3.2[a]				Procurement Procurement means obtaining equipment, supplies, or services by contract through purchase or lease, regardless of whether the quantities to be acquired are already in being or must be created, developed, demonstrated, and evaluated. It includes the selection of sources, solicitation, award of contract, funding, contract administration, and those technical and management functions directly related to satisfying requirements by contract.
	3.3[a]				Inventory management Inventory control includes maintenance of stock levels and replenishment of these levels so that (1) items are supplied to using organizations when and where they are needed; (2) overall investment in inventories is kept to a minimum, consistent with the need; and (3) the workload of supply transactions (including procurement actions and stock status and transaction reporting) is controlled, in both detail and frequency.
		3.3.1			Compute requirements Requirements computation is an ongoing process performed to support the wholesale inventory acquisition process. It is the computation, using various mathematical models, of the quantities of supplies and spare parts needed to meet the requisitioning demands of retail-level users. The first stage of requirements computation for major end items produces initial provisioning and allowance lists. This process identifies the spare parts to be delivered with the end item. As the end item is used operationally, a parts-demand history develops. Requirements computation is then based on the demand history trends integrated with other requirements information, such as program operational requirements, spares insurance requirements, etc.
		3.3.2			Acquire items The item manager must replenish stocks when the on-hand balance plus expected receipts reach the reorder point. Material can be acquired from a variety of sources, both internal and external. Internal sources include receipt of reparable items in serviceable condition from depot maintenance activities and returned retail excess material. External sources procurement contracts issuing a procurement request (PR) and delivery awarded by the item manager from provisioning item order (PIO) clauses on production contracts for initial stocks of new items.
		3.3.3			Receive items Receipt of material requires inspection before acceptance. It is important that this process be completed quickly so that shipments can be made on time, backorders can be released as soon as possible, and inventory managers can have timely balance information on which to base requirements studies.

[a] Not shown on process charts.

TABLE B-1

LOGISTICS PROCESS WORK BREAKDOWN STRUCTURE (Continued)

Indenture level					Function
1	2	3	4	5	
		3.3.4			Store items Storage of items includes logistics functions of management and operation of wholesale material storage sites: the process of storing or placing property in a wholesale warehouse or other designated storage facility.
			3.3.4.1[a]		Warehousing Warehousing operations encompass the actual movement and space allocation within a storage site and the upkeep and maintenance of stored material in place.
			3.3.4.2[a]		Physical inventory Physical inventory is the process of accounting for and controlling stock on hand. It includes physical counting, reconciliation of discrepancies, causative research, location surveys, and location reconciliations.
		3.3.5[a]			Distribute and redistribute items Distribution and redistribution are the logistics processes that position material at specific storage points and move material between storage points. Distribution systems consist of a complex series of echelons of supply, which extend from the ICP through a depot system and subsidiary storage points to the ultimate consumer.
		3.3.6[a]			Process requisitions Requisition processing matches demands or requests for material against wholesale inventory records for the purpose of issuing material.
		3.3.7[a]			Process returns The return process requires review, authorization, and disposition of surplus or excess material reported from below the wholesale level.
		3.3.8[a]			Issue items Items are released from the wholesale inventory in response to a requisition or other validated requirement. Issuing parts includes packaging, packing, documenting, and release of material for transportation to receiving activities.

[a] Not shown on process charts.

TABLE B-1

LOGISTICS PROCESS WORK BREAKDOWN STRUCTURE (Continued)

Indenture level					Function
1	2	3	4	5	
	3.4				Technical data management
		3.4.1[a]			Acquire technical data Technical data must be acquired, stored, retrieved, and distributed to maintain and repair, procure, and manage inventories of both end items and components. Technical data is the link between personnel and equipment and includes operating and maintenance procedures, special test procedures, installation instructions, checklists, change notices and change procedures, drawings, photographs, etc., for the weapon systems, support equipment, training equipment, transportation and handling equipment, and repair/replacement assemblies and parts.
			3.4.1.1[a]		Request TDP from external source When a TDP not in its repository is required by the ICP, that ICP requests a copy of the TDP from an appropriate source (another Service repository, engineering support activity, or the manufacturer).
			3.4.1.2[a]		Validate TDPs TDPs received from external sources are validated to ensure that they are complete, legible, and reflect the latest item configuration.
			3.4.1.3[a]		Index TDPs Technical data specifications, drawings, pictures, and related data must be indexed to DoD cataloged part numbers and NSNs. Technical data must be related to the appropriate level of detail to meet user requirements, from end items, fully assembled, through subassemblies and reparables, to individual parts.
		3.4.2[a]			Store TDP Technical data must be stored in repositories that protect the information from deterioration and restrict access to authorized users, but allow easy, efficient update and additions as physical configurations of material and equipment are changed.
		3.4.3[a]			Retrieve technical data Technical data must be found and collected/collated from the storage repositories for dissemination to authorized users.
		3.4.4[a]			Distribute technical data Copies of the retrieved TDP master must be made and distributed as appropriate.

[a] Not shown on process charts.

TABLE B-1

LOGISTICS PROCESS WORK BREAKDOWN STRUCTURE (Continued)

Indenture level					Function
1	2	3	4	5	
	3.5[a]				Transportation Transportation covers the movement of supplies in support of military operations or other requirements and includes planning, authorization, routing, and scheduling.
	3.6				Engineering support Each ICP provides engineering support services to item management and procurement personnel. Equipment specialists (ESs) review procurement specifications, qualify new sources of supply, assist in reviewing technical data needed for breakout operations and I&S, and assist in performing item reduction studies.
	3.7				Configuration management Configuration management at the ICP keeps track of the configuration of each end item assigned to each unit. Total end item, and therefore repair part, densities are products of this process. These data are used to compute stock levels and to identify assets that no longer have weapon system applicability.
4.0					End-item procurement The entire provisioning process is designed to provide timely spare parts support to weapon systems throughout their life cycles. Provisioning for developmental systems begins in the demonstration and validation phase when plans are finalized. During full-scale development, the provisioning work runs concurrently with design. As a program enters early production and deployment, provisioning must guarantee that fielded systems will be supportable. As production progresses, changes in design and configuration must be incorporated into the supply system quickly. After production, the emphasis shifts to performing breakout and maintaining supply lines as technology advances and sources of supply begin to diminish.
	4.1				Award development contract Upon award of the development contract, contractors participate in provisioning.
	4.2				Complete development contract At the completion of the development contract, a prototype system has been produced and tested. The production baseline has been set and the initial provisioning procurement cycle has begun.
	4.3				Award production contract The award of the production contract signifies the start of the ECP cycle that must be absorbed quickly into the supply support system.
	4.4				Initial operational capability (IOC) By IOC (first unit equipped, trained, and combat-ready), a system of supply support must be in place

[a] Not shown on process charts.

TABLE B-1

LOGISTICS PROCESS WORK BREAKDOWN STRUCTURE (Continued)

Indenture level					Function
1	2	3	4	5	
	4.5				Material support date The MSD is the date when the wholesale supply system will be able to provide supply support to weapon system users.
	4.6				Complete production contract At the completion of the production contract, the mission of the supply support community shifts from keeping pace with design changes to maintaining supply lines for end items that are no longer in production.
5.0					Test and evaluation Test plans and procedures that verify performance requirements are vital to the success of developing a new weapon system. Test results are used to improve the design and provide reliability information to the logistics engineer.
6.0					End-item usage Feedback from operational units early in the life of a system is used to improve design.
7.0					Production engineering Feedback from production is used to alter design to make systems more producible.
8.0[a]					Production run The period during which the system is produced in quantity is known as the production run.

[a] Not shown on process charts.

APPENDIX C

A SUPPLY PROCESS MODEL

INTRODUCTION

This model focuses on the front end of the supply process, where new items are introduced into the supply system and initial provisioning takes place. Much of the front-end supply process occurs as part of, or in conjunction with, weapon system acquisition. We hypothesized that Computer-Aided Acquisition and Logistics Support (CALS) would enable many sequential supply processes to be done concurrently, thus shortening the supply cycle.

To test our hypothesis, we built a project-management model of the logistics and key nonlogistics tasks involved in a generic weapon system acquisition program. The model displays task schedules and the time relationships among tasks in a Gantt chart format, shown in Figure C-1. Although the model does not portray the supply processes of any specific weapon system program, we believe that it represents a typical developmental program.

The model assumes a project that began on 2 January 1990 with a 12-month prototype design period and a 24-month production run.

No concurrent engineering or on-line data transfer is assumed in the current supply system model. While individual examples of these capabilities exist within the Government, they are not widespread.

The basic model was run in three settings to display front-end supply process schedules that reflect the following: first, pre-CALS supply processes as a baseline for comparing the effects of CALS improvements; then, the effects on the baseline after implementing mid-term CALS improvements in the supply process; and, finally, the effects of implementing long-term CALS improvements.

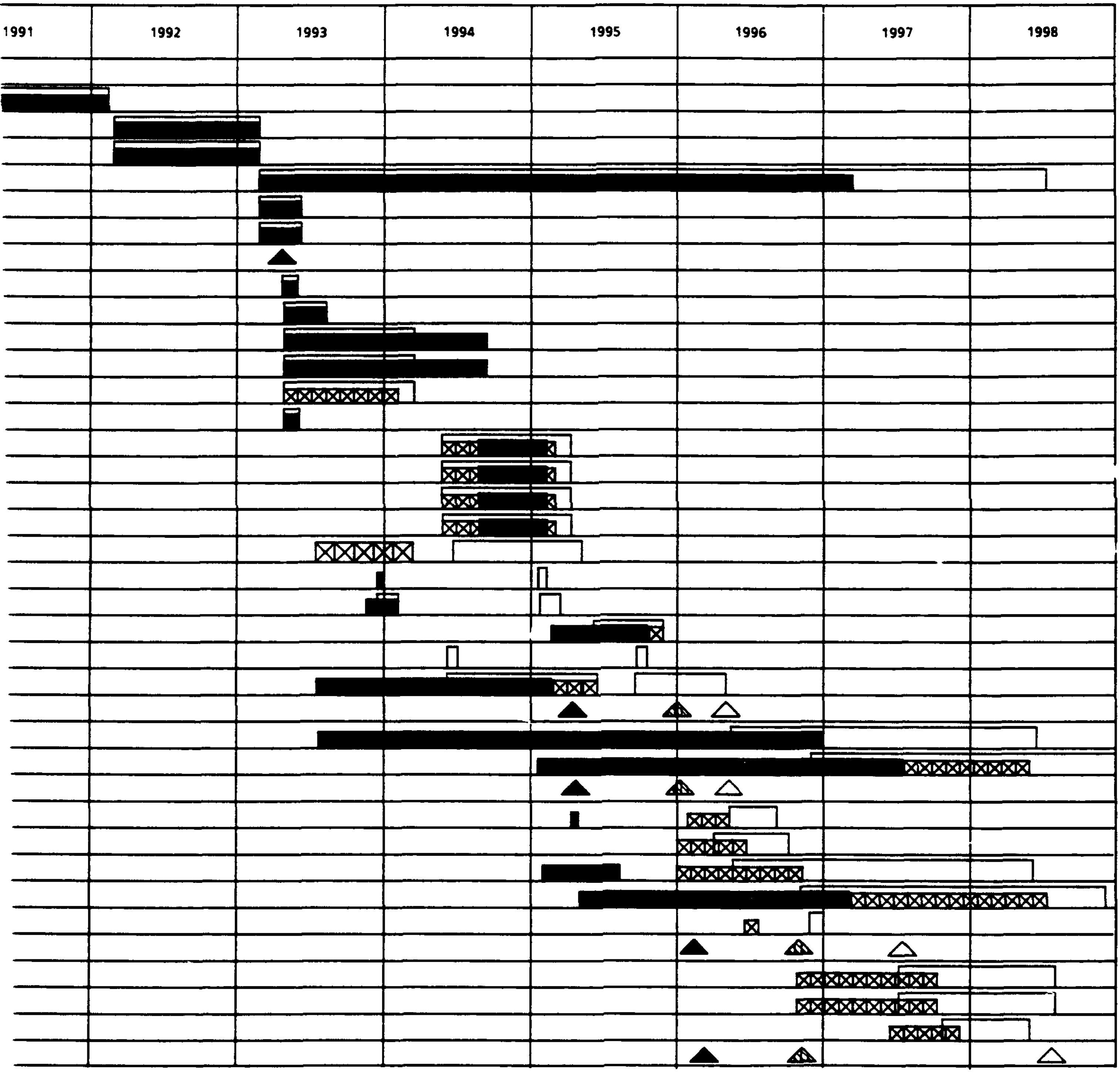
The model shows effects on elapsed time only. Other benefits accrue from CALS that are not directly illustrated by this model. For example, the initial provisioning cycle task appears to take longer as CALS is implemented. This is true in the sense that it can begin earlier in the life cycle and will continue throughout most of the

Task name	WBS Code (Appendix B)	1990	1991	1992
Pre-concept phase				
Concept exploration phase				
Demonstration and validation phase				
Initial design	1.1.1			
Full-scale development phase				
Develop interim support plan	2.3.4.1			
Specify parts control/provisioning	1.2.1.2.3.1			
Award development contract	4.1			
Provisioning Guidance Conference	2.3.2.1			
Develop transition plan	2.3.4.2			
Prototype design	1.1.2			
Maintenance engineering	2.4			
Parts control	1.2			
Long-Lead Item Conference	2.3.3.2			
Test and evaluation	5.0			
Redesign (test results)	1.1.3.3			
Redesign (logistics requirements)	1.1.3.1			
Redesign (parts control)	1.1.3.2			
Generate initial PTD/SPTD	2.3.2.2			
Determine long-lead items	2.3.3.1			
Initiate long-lead procurement	2.3.3.3			
Develop production baseline	1.1.5			
Determine interim requirements	2.3.4.3			
Submit PTD/SPTD to Services/DLA	2.3.2.5/6			
Complete development contract	4.2			
Provisioning	2.3			
Production and deployment phase				
Award production contract	4.4			
Production engineering	7.0			
Procure interim requirements	2.3.4.4			
ECP cycle prior to MSO	1.1.4			
Production run	8.0			
Receive interim support items	2.3.4.5			
Achieve initial operating capability	4.4			
Provide interim support	2.3.4.6			
Provide consumption data	2.3.4.8			
Complete production drawings	1.1.6			
Reach material support data	4.5			

Notes: WBS = work breakdown structure; PTD/SPTD = provisioning technical documentation/supplemental PTD; ECP = engineering change prop

Pre-CALS — With mid-term CALS improvements — With long-term CALS improvements

FIG. C-1. EFFECTS OF CALS ON S



ːP = engineering change proposals; MSD = materal support date.

ˋents

EFFECTS OF CALS ON SUPPLY PROCESS SCHEDULE

production run. Fewer total supply support requests (SSRs) and design change notices (DCNs) should be processed during the provisioning cycle, and CALS will expedite those SSRs and DCNs that are required, reducing provisioning resource requirements or allowing reassignment of resources to other high-priority work.

THE CURRENT SUPPLY SYSTEM

The tasks shown in the model are drawn from the logistics process work breakdown structure (WBS) listed in Appendix B. The model concentrates on the weapon system requisition supply processes in the full-scale development phase and the production and deployment phase. Key nonlogistics tasks are shown to illustrate how supply activities fit into the overall weapon system acquisition program. A brief description of each task appears in Appendix B under the WBS code.

The pre-CALS schedule is highly sequential. Programs are delayed and inventory control point (ICP) workloads fluctuate as large batches of data move through the supply system.

EFFECT OF MID-TERM CALS IMPROVEMENTS

General

CALS development at mid-term will permit much more data sharing through digital exchange and on-line access for review and coordination. We have looked for opportunities to speed data transfer and to increase data access that would compress the time required to complete supply tasks. Our hypotheses are that (1) movement of digital data will reduce delay between processes, (2) wider access to data will permit more processes to act on the data simultaneously and to react sooner to changes in data, and (3) on-line coordination of data deliverables will reduce coordination cycle times.

We also examined the process to find places where data are maintained or decisions are made remotely from the point of origin of the data. We contend that data can be maintained more accurately and efficiently, and better decisions can be reached more quickly, at the source of the data than elsewhere.

By identifying supply processes that could benefit from CALS' mid-term improvements, our model computed a 19 percent decrease in elapsed time to organic material support date (MSD) in our generic weapon system program, bringing MSD

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UNCLASSIFIED MDA903-90-C-0006 NL

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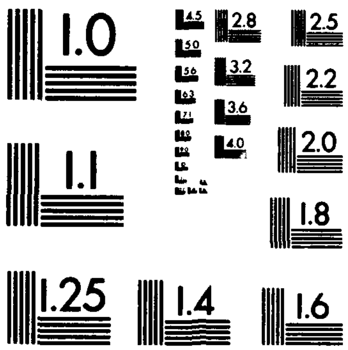
1.0
2.8
2.5
3.2
2.2
3.6
4.0
2.0
1.1
1.8
1.25
1.4
1.6

concurrent with initial operational capability (IOC) for design-stable items (see Figure C-1). A description of the major schedule changes follows.

Parts Control

The first significant schedule improvement is a reduction in time required for parts control. Since the contractor would be permitted to make parts control decisions locally (subject to Government audit), the contractor would not have to wait for program manager/Military Parts Control Action Group (MPCAG) approval of nonstandard parts requests.

Provisioning

The next major schedule change is the acceleration of initial provisioning technical documentation/supplemental provisioning technical documentation (PTD/SPTD) generation by the contractor. This acceleration would result from automatic updates of provisioning records from design records on an item-by-item basis as design proceeds. Provisioning actions could be started as soon as an item became design-stable rather than waiting for provisioning data to be accumulated in batches. Long-lead procurements could also begin earlier.

Submittal of PTD/SPTD to the Government for provisioning review could begin earlier as well. Provisioning review would be on line, with supply support action proceeding on approved provisioned items without waiting for a provisioning conference. In fact, provisioning conferences could be eliminated entirely for all but a few difficult items that required face-to-face discussions.

ICP artificial intelligence software can identify items in Service Logistical Support Analysis Record (LSAR) files which are ready for SSR action and automatically initiate appropriate action at the ICP rather than wait for the Service to prepare an SSR. Providing digital PTD/SPTD would aid integration of SSRs with supporting technical data at the ICP, speeding ICP action on SSRs.

The time required to get a national stock number (NSN) assigned after receipt of an SSR can be reduced for each new item by having the contractor rather than the Government prepare the item identification. The item identification could be prepared simultaneously with other work by the contractor, and delays caused by waiting for technical data transmittal to the Government would be avoided.

By concentrating only on design-stable items throughout phased provisioning, fewer DCNs would need to be processed by the ICPs, leaving more resources to process initially design-unstable items as they stabilize later in the life cycle. Greater design-stability of provisioned items would also cause fewer resolicitations; these are required when design changes are received after original solicitations have been issued. More contracting resources would be available to concentrate on procuring late-maturing provisioned items. Overall administrative lead time should be reduced, leading to decreased pressure to provision design-unstable items prematurely in a counterproductive effort to meet the MSD.

Organic Material Support Date

The earlier start for provisioning and the reduced administrative lead times should allow the supply system to advance its organic MSD. In the model, MSD was moved up to match IOC. By so doing, interim contractor support could be limited to those few remaining design-unstable items.

EFFECT OF CALS LONG-TERM IMPROVEMENTS

When CALS long-term improvements have been made, two key developments will drive supply processes: the Integrated Weapon System Data Base (IWSDB) and concurrent engineering (CE). While CE takes place today, availability of the IWSDB is expected to broaden CE's functions and broaden its effect. We have looked at how long-term CALS improvements in supply management can change weapon system acquisition schedules.

Our hypotheses are that (1) because some supply functions will be performed concurrently during CE, they will lose their identities as separate functions; (2) in-place data delivery and remote access to weapon system data will be more commonplace as the IWSDB makes real-time data access more feasible; and (3) some requests like SSRs and DCNs, which now trigger supply management actions, will no longer be necessary since ICPs will be aware of the actions required by having access to the IWSDB.

By identifying supply processes that could benefit from CALS long-term improvements, we estimate an additional reduction in the elapsed time to reach MSD beyond those reductions resulting from CALS' mid-term improvements (see Figure C-1).

Prototype Design

The prototype design period is expected to take full advantage of CE and availability of the IWSDB. We anticipate that the design period will be longer than it is today in order to accommodate the coordination of production and logistics requirements into weapon system design. We also expect, however, that this additional time would be more than compensated for by reduced workloads in the out-years because of higher quality design.

Parts Control

Because parts control would not be performed as a separate function, it has been eliminated from the long-term schedule. Designers will have ready access to the standardization information and characteristics search capability necessary to make real-time parts control decisions during the design process. The Government would make off-line audits of contractor parts control decisions, but these audits would not constrain the schedule.

Test and Evaluation/Redesign

Concurrent engineering is expected to produce a higher quality design that will require less testing and fewer design changes. This benefit alone may compensate for additional time spent in the design phase.

Generate Initial PTD/SPTD

Generation of initial PTD/SPTD would be eliminated in the long term. Basic information from the design data base would form the basis for further supply processing automatically, eliminating the need to search for the design data and use them to create a separate supply data base. Also, computer-aided design/computer-aided manufacturing (CAD/CAM) data would be directly usable as PTD/SPTD while the designer completed portions of the design at the workstation.

Interim Contractor Support

Since MSD can coincide with IOC, there would be no need for interim contractor support except for those small numbers of parts or components whose design may remain unstable beyond IOC. Therefore, all tasks related to interim contractor support are deleted from the long-term timeline.

Provisioning

With the IWSDB and on-line review capabilities, provisioning can begin on an item-by-item basis at the start of design. As part designs are stabilized, basic design data are made available to provisioners who can start provisioning action immediately. ICP access to the IWSDB will eliminate the need for SSR preparation and submittal to notify the ICP of actions required. Provisioning times can be shortened partly by getting an earlier start and partly by further reducing the number of DCNs to be processed because fewer design changes would be generated under CE. The increased ability to limit provisioning to design-stable items only will reduce DCNs further.

Item Identification

Item identification would be performed as an integral part of the design process and not as a separate function. Appropriate item identification data would be gathered from CAD/CAM and computer-integrated manufacturing data and stored as part of the Product Data Exchange using STEP (PDES) product definition data.

Production Engineering

Since producibility will be designed into the weapon system from the beginning, very little design change should be necessary to enter production. Production may begin sooner and IOC may be reached earlier.

Complete Production Drawings

On-line access to CAD/CAM and computer integrated manufacturing data will eliminate the separate preparation, delivery, review, and acceptance of production engineering drawing packages.

Organic Material Support Date

Implementing long-term CALS supply process improvements would allow organic MSD to be accelerated along with IOC.

APPENDIX D

RECOMMENDED CHANGES TO POLICY

Policy changes, required to use Computer-aided Acquisition and Logistics Support (CALS) in supply, fall into two categories:

- Changes that are mainly the responsibility of supply management
- Changes that are required to use CALS within supply, but are managed outside of supply.

Proposals directing the first category of changes that have been developed for insertion in the draft DoD Directive 4140.1, *Supply Policy*, and related standards are included in this appendix. The second category of changes has been discussed throughout this report; these issues are summarized in this appendix.

Major benefits from CALS are dependent on early preparation, the quality of these preparations, and coordination of the complex systems and infrastructures to be developed over the longer term. Unless adequate resources and work are applied to all of these requirements, the effective use of CALS within supply could be delayed. Considerable, unnecessary costs will be incurred if the support does not develop and supply operations are forced to continue to use current processes any longer than necessary.

Under the Heading "Logistics Technology (LOGTECH) Program," Page 10, Paragraph 3.7.D

Recommendation	Comment
Add the following: "... issuances. Computer-Aided Acquisition and Logistic Support (CALS) technology offers many benefits for supply operations. CALS utilization and related education and training are to be encouraged within supply. Major equipment and system acquisitions, process, and system changes provide opportunities for improving performance by using CALS. New acquisitions, process and system change proposals are to include statements indicating the extent of the intended use of CALS technology. Proposals for new acquisitions should comply with DoD CALS standards. Extra evaluation weight should be given to those proposals that do use CALS standards and meet jointly agreed CALS supply functional requirements and implementation proposals.	Logistics and supply managers, their work forces, and users of logistics and supply processes and services, need to focus their attention on CALS today to avoid being left behind by industry and missing opportunities to maximize returns on CALS investments.

MILITARY STANDARD (MIL-STD) 1561B, *PROVISIONING PROCEDURES, UNIFORM,* DEPARTMENT OF DEFENSE, DATED 17 NOV 1981

MIL-STD-1561B prescribes the terms and conditions governing the provisioning of end items procured by DoD and the responsibilities of contractors:

SPECIFICATIONS AND STANDARDS

Recommendation	Comment
Add to Section 2.2.1: "*MIL-D-28000, Digital Representation for Communication of Product Data IGES Application Subsets); MIL-R-28002, Raster Graphics Presentation in Binary Format, Requirements for MIL-D-28003, Digital Representation for Communication of Illustration Data; CGM Application Profile; and MIL-STD-1840, Automated Interchange of Technical Information.*"	CALS standards needed for digital delivery of supplemental provisioning technical documentation (SPTD).
Add to Section 2.1.2: "*MIL-HDBK-59, Department of Defense Computer-Aided Acquisition and Logistic Support (CALS) Program Implementation Guide.*"	Provides guidance for acquisition personnel to assist in the transition to digital data delivery and access.

SPTD SUBMISSION – SECTION 5.3.13.2

Recommendation	Comment
Insert the sentence: "Digital submission of SPTD may also be required in accordance with MIL-STD-1840."	Digital submission and processing of SPTD should be encouraged.

INCREMENTAL SUBMISSION – SECTION 5.5

Recommendation	Comment
Insert the line: "Incremental submission should be closely tied to component design stability. Design-unstable components should be procured as late as possible in order to minimize the number of design change notices (DCNs)."	This policy, in concert with a change to the Logistics Support Analysis Record (LSAR) to account for design stability, should reduce the number of DCNs processed.

MIL-STD-1388-2A, DoD REQUIREMENTS FOR A LOGISTICS SUPPORT ANALYSIS RECORD

MIL-STD-1388-2A guides preparation of provisioning technical documentation, defines provisioning data elements, and specifies format.

LSAR A RECORD

Recommendation	Comment
Add a yes/no field to the LSAR A record to indicate whether design stability has been achieved. This is a decision to be made by the contractor to indicate the likelihood for further design change before establishing the baseline design.	This field will be used for contracts that call for incremental, or phased, provisioning. Provisioning for unstable components should be deferred until as late as possible.

PROGRAM PARTS SELECTION LIST (PPSL) DATA ELEMENT – DEN 337

Recommendation	Comment
This field is currently used to indicate whether the part is, or is not, included on the parts control list of authorized parts, or the PPSL. This field should be expanded to include the PPSL sequence code shown on DI-E-7027A.	This change would allow provisioning to be linked to parts control. It would provide an audit trail to ensure parts control decisions are actually implemented.

APPENDIX E

COMPUTER-AIDED ACQUISITION AND LOGISTICS SUPPORT RELATED PROJECTS THAT AFFECT SUPPLY SUPPORT IMPACT

The Computer-aided Acquisition and Logistics Support (CALS) related programs and processes that we reviewed are listed in Table E-1 and described in Table E-2.

TABLE E-1

CALS-RELATED SUPPLY PROCESSES

Military Department/ agency	Supply processes						
	ILS planning	Parts control	LSA/LSAR	Provisioning	Cataloging	Technical data	Inventory
Navy			SSN 21 SAILLS	UADPS/ICP ICAPS SPS		EDMICS NAIS RAMP	UADPS/ICP RAMP
Air Force			B-2 LSMIS C-17 CLASS	IPMIS		EDCARS B-2 LSMIS	RDB WSMIS
Army	LOGPARS		Army CALS			DSREDS Army CALS TD/CMS	CCSS
DLA		MPCASS	DRAMA	DRAMA	DLIS LOGRUN FLDS GIRDER FEDLOG DRAMA CTOL	MEDALS TIIF	SAMMS DRAMA MARS WSSP

Note: ILS = Integrated Logistics Support; LSA/LSAR = Logistics Support Analysis/Logistics Support Analysis Record; DLA = Defense Logistics Agency.

TABLE E-2

SUPPLY PROCESS DESCRIPTIONS

Project	Service
1. EDMICS – Engineering Drawing Management Information Control System EDMICS is an electronic repository for technical drawings. EDMICS will provide an interface with contractor CAD/CAM data, automate spare part bid set data, allow remote transmission of engineering data to maintenance technicians, and permit authorized remote terminals to review and update drawings on line. EDMICS is expected to decrease administrative lead times for procuring spare parts by 20 percent. *Status*: The prototype system is installed and undergoing test. Navy and DLA repositories are expected to implement EDMICS in FY91.	Navy/DLA
2. UADPS/ICP – Uniform Automated Data Procedures/Inventory Control Points (Modernized) Inventory control software for the two Navy Inventory Control Points, Ships Parts Control Center (SPCC), and Aviation Supply Office (ASO). Functions include a. Weapon system management • Program support ▸ Provisioning ▸ Configuration status accounting ▸ Allowance determination b. Supply management • Cataloging • Budgeting and accounting • Requirements determination • Purchasing • Inventory management • Repair management • Supply transaction processing. Although not specifically a CALS system, CALS will have an influence on the use of digital data to perform these functions. *Status*: The modernization effort has been held in abeyance pending outcome of the Corporate Information Management (CIM) and the LSIS projects.	Navy
3. NAIS – Navy Automated Indexing System Navy technical data package indexing system. *Status*: Operational.	Navy

Note: CAD/CAM = computer-aided design/computer-aided manufacturing; LSA- = Logistics Support Analysis; LSIS = Logistics Standard Information System; MIL-STD = military standard.

TABLE E-2

SUPPLY PROCESS DESCRIPTIONS (Continued)

Project	Service
4. ICAPS – Interactive Computer Aided Provisioning System ICAPS is an on-line provisioning application used by Navy equipment specialists to edit and validate contractor-prepared provisioning technical documentation (PTD) before entering it into the UADPS/ICP provisioning system. Contractors can either enter provisioning data directly into ICAPS from a remote terminal or use a PC version of ICAPS and mail floppy disks. ICAPS will also load from MIL-STD 1552 or LSA-036 tapes. Although not specifically designed as a CALS system, ICAPS is a step toward interactive transfer and approval of Logistics Support Analysis Record (LSAR) data. ***Status***: Operational.	Navy

Note: CAD/CAM = computer-aided design/computer-aided manufacturing; LSA- = Logistics Support Analysis; LSIS = Logistics Standard Information System; MIL-STD = military standard.

TABLE E-2

SUPPLY PROCESS DESCRIPTIONS (Continued)

Project	Service
5. SPS – Ships Provisioning System SPS is an on-line application used at SPCC to input provisioning data into the Weapon Systems File (WSF). SPS receives input from ICAPS. SPS was designed as a temporary system to be replaced by the modernized UADPS/ICP. ***Status***: Operational.	Navy
6. RAMP – Rapid Access to Manufacturing Parts RAMP is a computerized manufacturing technology that produces parts on demand. RAMP can reduce unit cost by 30 percent, production facilities by 50 percent, and lead times by as much as 90 percent. ***Status***: Installed and operating on a test basis. Designers of the product definition databases used by RAMP are attempting to follow the evolving Product Data Exchange using STEP (PDES) standard. ***Status***: Operational.	Navy
7. SSN 21 Seawolf Integrated Logistics Support System (SAILSS) The SSN 21 program is demonstrating many of the benefits that can be derived from the integration of engineering and logistics databases, on-line access into LSAR, and digital delivery of data. Many of the logistics problems with past submarine designs resulting from configuration control and provisioning have been eliminated. ***Status***: Operational.	Navy
8. EDCARS – Engineering Data Computer Assisted Retrieval System EDCARS is an Air Force Logistics Command (AFLC) program that automates the requisitioning, indexing, filing, retrieval, and distribution of its engineering data repositories. EDCARS was acquired jointly with the Army Digital Storage and Retrieval Engineering Data System (DSREDS) program office. ***Status***: Installed and operating for approximately 4 years.	Air Force
9. IPMIS – Initial Provisioning Management Information System IPMIS is an on-line provisioning system that will be used by Air Force equipment specialists and item managers to replace the batch-oriented D220 provisioning system. ***Status***: Expected to be implemented in FY93.	Air Force
10. RDB – Requirements Data Bank The RDB is a large AFLC program that will replace 23 current batch systems with an on-line capability to compute worldwide material requirements for spares and repair parts. ***Status***: Partially operational.	Air Force

TABLE E-2

SUPPLY PROCESS DESCRIPTIONS (Continued)

Project	Service
11. WSMIS – Weapon System Management Information System WSMIS enables managers to view data from a weapon system perspective against varying operational plans. WSMIS consolidates data collected from several data systems and presents the data online through prestructured reports and responses to ad hoc queries. ***Status***: Operational.	Air Force
12. B-2 CALS Demonstration Project The Logistics Support Management Information System (LSMIS) is used by the B-2 contractor, Northrop, to support the Air Force. The B-2 version provides for digital delivery of supplemental provisioning technical documentation (SPTD) and on-line provisioning item orders (PIOs). ***Status***: Versions of this software have been used by the Air Force and Northrop for maintenance analysis, for preparation of the LSAR, and for performing on-line provisioning conferences.	Air Force
13. C-17 CALS Demonstration Project (CLASS) This is a contractor (McDonnell-Douglas) system, called Comprehensive LSA Automated Reporting System (CLASS), used to support the Air Force. Air Force maintenance and provisioning specialists have on-line access into LSAR data. ***Status***: Operational.	Air Force
14. *CCSS – Commodity Command Standard System (Modernized)* CCSS is an automated integrated business system designed to control stock, manage supply, and perform provisioning functions at the wholesale level. Major system hardware and software upgrades are planned over a 10-year period. ***Status***: Conversion of provisioning master records to relational database format is scheduled for FY91.	Army
15. LOGPARS – Logistics Planning and Requirements System LOGPARS is an expert system that helps program managers to plan the logistics requirements for a specific program. It can tailor the LSA/provisioning logistics Contract Data Requirements List (CDRL) items for specific acquisition programs. ***Status***: Under development by AMC; expected to be completed in FY91.	Army
16. *Army CALS Procurement* The Army plans a four-phase procurement of a total Army CALS infrastructure, to include an Integrated Weapon System Data Base (IWSDB). ***Status***: The Army will select two semifinalist contractors to develop a proof-of-concept system. The winner of this competition will continue toward full implementation.	Army

TABLE E-2

SUPPLY PROCESS DESCRIPTIONS (Continued)

Project	Service
17. TD/CMS – Technical Data /Configuration Management System (Modernized) TD/CMS is an indexing system used to prepare technical data packages (TDPs) to support the acquisition process. It has been redesigned as an interactive system. *Status*: Operational.	Army
18. DLIS – Defense Logistics Information System (formerly called DLIS, Defense Logistics Information System) DLIS is a modernization of the DLIS system. DLIS will allow access to more remote users by using a relational database design and fourth-generation software for application programs. The new system will have increased flexibility. *Status*: Implementation is incremental with full implementation scheduled for FY92.	DLA
19. LOGRUN – Logistics Remote User Network LOGRUN is a menu-driven system that allows remote users access to Defense Logistics Support Center (DLSC) databases and applications. After modernization and with the arrival of the defense data network (DDN), the Service will be able to add more users, including contractors. *Status*: Operational.	DLA
20. DLA Online Characteristics Search System LOGRUN allows users to search for items by characteristics. After modernization, a much improved system will be available. *Status*: Operational.	DLA
21. FLDS – Federal Logistics Data Service The DLSC logistics information networking concept for the future is called FLDS. Some aspects of the concept are being implemented today, such pass-throughs: projects to connect DLIS with other systems through telecommunication links, and network gateways: linking with other networks such as Navy Logistics Network (NLN). The goal of FLDS is to give the user a single "window" to all logistics data including: LSAR, technical data, and asset data. *Status*: Several *pass-throughs* and *gateways* have been implemented.	DLA
22. GIRDER – Government/Industry Reference Data Edit and Review GIRDER is a program administered by DLSC that has established active relationships with commercial vendors in order to keep the DLIS database as current as possible with vendor part number and source-of-supply information. *Status*: Operational.	DLA

TABLE E-2

SUPPLY PROCESS DESCRIPTIONS (Continued)

Project	Service
23. CTOL – Cataloging Tools On-Line CTOL is a system that aids the cataloger to prepare Federal item identifications. Drawings that are scanned into the system can be examined in a graphics window at the terminal. Ten cataloging-related research files are available on-line. It is planned to link this system to EDMICS. *Status*: Prototype operational at Defense Construction Supply Center (DCSC).	DLA
24. FEDLOG – Federal Logistics Data on Compact Disk Compact disk-read only memory (CD-ROM) PC-based system that replaces much of DLA's microfiche cataloging data. *Status*: Operational.	DLA
25. DRAMA – Data Review, Analysis, and Monitoring Aid DRAMA is a prototype, proof-of-principle application that will give DLA provisioning/cataloging personnel access to Service/contractor initial provisioning data before receipt of supply support requests. DRAMA will also monitor the provisioning files for changes that affect DLA stocking levels and procurement actions. DLa plans that DRAMA will ultimately eliminate the need for supply support requests (SSRs). *Status*: C-17 LSAR being used for testing FY90.	DLA
26. MARS – DLA Materiel Readiness Support System MARS is an inventory analysis tool used to predict and monitor the level of DLA supply support to specific weapon system items or specific military units. *Status*: Operational.	DLA
27. MEDALS – Military Engineering Data Asset Locator System MEDALS is a DoD indexing data base for technical data. By entering a part number, or a national stock number, the data base locates the repository holding the drawings. Modernization will provide on-line ordering of technical data and inclusion of technical manual references. Included on LOGRUN menu. *Status*: This database is operational but not fully populated.	DLA
28. TIIF – Technical Information Index File TIIF indexes techinical data package files that exist at each DLA supply center. Newly received technical data are indexed to reflect relationships between documents (top-down breakdown/technical data packages), titling of large documents, limited rights determinations, physical location, and other information. These indexing data are recorded in the TIIF. The TIIF is divided into parts: one part shows all documents in document-number sequence; the other shows NSN-to-document relationships (TDPs or bid sets). These files are also used to update MEDALS in a batch mode. *Status*: Operational.	DLA

TABLE E-2

SUPPLY PROCESS DESCRIPTIONS (Continued)

Project	Service
29. WSSP – Weapon System Support Program WSSP indexes technical data package weapon system files at each DLA supply center. These files relate NSNs to weapon systems. WSSP is used to provide greater safety levels for critical weapon system items. The files are maintained by the Services through AUTODIN transactions. *Status*: Operational	DLA
30. MPCASS – Modernized Parts Control Automated Support System MPCASS is an on-line system used by the contractor, program manager (PM), and MPCAG to submit and track nonstandard part requests. Also, the MPCAG will have on-line access to Government-Furnished Baselines (GFBs) and Qualified Production Lists (QPLs), as will the contractor. MPCASS will reduce the time to process the nonstandard part requests from to 5 to 10 days to 15 days. *Status*: Phase 1 of MPCASS was implemented in FY90.	DLA
31. SAMMS – Standard Automated Material Management Systems (Modernized) The DLA ICP database and software included in modernized SAMMS: a. Weapon system management control b. Demand data analysis c. Full purchase request tracking d. Automated award notification e. Technical data index on-line inquiry and maintenance f. On-line customer data complaint system. *Status*: The modernization effort has been held in abeyance pending outcome of the Corporate Information Management (CIM) and the LSIS projects.	DLA

Note: AUTODIN = Automatic Digital Network; MPCAG = Military Parts Control Action Group.

APPENDIX F

COMPUTER-AIDED ACQUISITION AND LOGISTICS SUPPORT TRANSITION PLAN

The nine major study recommendations have been stated as objectives and grouped into management and procedural categories for this Computer-aided Acquisition and Logistics Support (CALS) transition plan (see Tables F-1 through F-7). The tables, the specific actions required are listed along with the implementation schedule, the major issue to be addressed, and office of primary responsibility (OPR) for each action.

The "Term" column indicates the period during which action is expected to occur:

- Short means 1991 – 1992.
- Mid means 1993 – 1997.
- Long means 1998 – 2010.

The "Issue" column indicates one of the primary issues that the action will address:

- Inventory – Reduces inapplicable inventory, or surplus parts
- Availability – Increases weapon system availability
- Response – Increases responsiveness of supply system
- Other – Contributes to other, less important functions.

TABLE F-1

PROCEDURAL OBJECTIVE A: USE CALS TECHNIQUES TO IMPROVE THE CURRENT SUPPLY SYSTEM

Action required	Term	Issue	OPR
1. Develop improved characteristics search tools	Short	Inventory	DLA
2. Facilitate use of related technology such as AI and expert systems in CALS applications	Short	Inventory	LSIS
3. Refine and implement DRAMA	Short	Inventory	DLA
4. Expand LOGPARS to include logic for tailoring LSA/LSAR and provisioning	Short	Inventory	Army
5. Expand and refine the GIRDER program	Short	Inventory	DLA
6. Allow DLA to exercise procurement options on weapon system contracts	Short	Other	OSD
7. Improve DCN processing	Mid	Inventory	LSIS
8. Improve SSR processing	Mid	Inventory	LSIS
9. Create prototype to demonstrate SPTD digital receipt and processing	Mid	Inventory	OSD
10. Provide contractor access to Government data bases (reverse CITIS)	Mid	Inventory	LSIS
11. Allow all DoD contractors to have access to LOGRUN	Mid	Inventory	DLA
12. Improve release of orders based on need date	Mid	Inventory	LSIS
13. Improve integrated procurement systems	Mid	Inventory	LSIS
14. Upgrade and fully implement MEDALS as a step toward the IWSDB and PDES	Mid	Inventory	DLA
15. Develop software for tracking TDP due-ins	Mid	Inventory	LSIS
16. Improve alternate reference number processing	Mid	Inventory	DLA
17. Develop software for keeping contractor LSAR	Mid	Inventory	DLA
18. Improve the DoD inactive item program	Mid	Inventory	DLA
19. Improve wholesale requirements forecasting	Mid	Availability	LSIS
20. Develop a DoD-wide system for capturing part-numbered demand data	Mid	Response	LSIS
21. Develop a DoD-wide system for capturing maintenance consumption data	Mid	Response	LSIS
22. Develop/explore on-line assignment of CAGE codes	Mid	Other	DLA
23. Implement digital receipt and processing of SPTD DoD-wide	Long	Inventory	OSD
24. Implement on-line review and approval for all provisioning	Long	Inventory	OSD

Note: DLA = Defense Logistics Agency; LSIS = Logistics Standard Information Systems; DRAMA = Data Review, Analysis, and Monitoring Aid; LSA/LSAR = Logistics Support Analysis/Logistics Support Analysis Record; GIRDER = Government/Industry Reference Data Edit and Review Program; DCN = design change notice; SSR = supply support request; SPTD = supplemental provisioning technical documentation; CITIS = Contractor Integrated Technical Information Service; LOGRUN = Logistics Remote User Network; MEDALS = Military Engineering Data Asset Locator System; IWSDB = Integrated Weapon System Data Base; PDES = Product Data Exchange using STEP; TDP = technical data package; CAGE = commercial and government entity; AI = Artificial Intelligence; LOGPARS = Logistics Planning and Requirements System (Army).

TABLE F-2

PROCEDURAL OBJECTIVE B: MODIFY SELECTED SUPPLY MANAGEMENT FUNCTIONS

Action required	Term	Issue	OPR
1. Encourage phased provisioning based on design stability	Short	Inventory	OSD
2. Improve interim support	Short	Availability	OSD
3. Prototype/demonstrate contractor item identification in a contract	Short	Other	DLA
4. Shift the item identification function to prime contractors	Short	Other	DLA
5. Demonstrate contractor parts control in a contract	Mid	Inventory	DLA
6. Shift the parts control function to prime contractors	Mid	Inventory	DLA

TABLE F-3

MANAGEMENT OBJECTIVE C: INCREASE FUNCTIONAL CONTROL OVER IMPLEMENTATION OF CALS IN SUPPLY MANAGEMENT

Action required	Term	Issue	OPR
1. Provide strong functional leadership in identifying problems and solutions	Short	Other	OSD
2. Coordinate implementation across organizational and functional boundaries	Short	Other	OSD
3. Implement CALS improvements in close coordination with DoD supply system consolidation efforts	Short	Other	OSD

TABLE F-4

OBJECTIVE D: PARTICIPATE IN RELATED TECHNOLOGY INITIATIVES OUTSIDE IMMEDIATE SUPPLY MANAGEMENT DOMAIN

Action required	Term	Issue	OPR
1. Promote digital delivery and receipt of parts-related technical data	Short	Inventory	OSD
2. Encourage/explore CITIS provisioning uses	Short	Inventory	OSD
3. Participate in the PDES development effort	Short	Inventory	OSD
4. Assist in the development of the IWSDB architecture and application software	Short	Availability	OSD
5. Promote use of concurrent engineering (CE) and provide representation on CE design teams	Short	Availability	OSD
6. Promote better reverse engineering tools	Short	Response	OSD/ Services
7. Promote RAMP technology for PDES development	Short	Response	OSD
8. Implement PDES and interface with IWSDB and DLIS	Long	Inventory	OSD
9. Implement the IWSDB	Long	Inventory	OSD
10. Implement RAMP DoD-wide	Long	Response	OSD

Note: RAMP = Rapid Access to Manufacturing Parts; DLIS = Defense Logistics Information System.

TABLE F-5

OBJECTIVE E: DEFINE SUPPLY MANAGEMENT DATA REQUIREMENTS TO BE INCLUDED IN IWSDB CONCEPTUAL DESIGNS

Action required	Term	Issue	OPR
1. Provide life-cycle maintenance of LSAR	Short	Inventory	OSD
2. Measure provisioning performance	Mid	Inventory	LSIS
3. Improve PIO processing and status	Mid	Inventory	LSIS
4. Link TDP to LSAR with due-in tracking and status	Mid	Inventory	LSIS
5. Provide part-number demand visibility	Mid	Inventory	LSIS
6. Provide TIR maintenance from contractor data bases	Mid	Inventory	LSIS
7. Update contractor LSAR from Government supply system output (reverse LSA-036)	Mid	Inventory	DLA
8. Develop a standard system for item management that can be used for both contractor and organic support	Mid	Availability	LSIS
9. Provide maintenance feedback to the supply system	Mid	Response	LSIS
10. Provide visibility to design stability at the component level	Long	Inventory	OSD
11. Provide access to SPTD	Long	Inventory	LSIS
12. Provide real-time DCN processing	Long	Inventory	LSIS
13. Eliminate SSRs	Long	Inventory	LSIS
14. Relate inventory investment to weapon system availability	Long	Availability	LSIS
15. Improve supply responsiveness to changes in OPTEMPO, force structure, density, etc.	Long	Response	LSIS

Note: PIO = provisioning item order; TIR = total item record (DLA); LSA-036 = Provisioning Requirements Summary report; OPTEMPO = Operatonal Tempo.

TABLE F-6

OBJECTIVE F: RESOLVE A RANGE OF POLICY ISSUES TO PREVENT LIMITATIONS ON CALS

Action required	Term	Issue	OPR
1. Resolve the conflict between laws requiring full and open competition and the potential for closer relationships between Government and contractors resulting from data base integration	Short	Inventory	OSD
2. Eliminate pre-provisioning screening time constraints	Short	Response	OSD

TABLE F-7

OBJECTIVE G: CONDUCT A CALS TRAINING/INDOCTRINATION PROGRAM FOR THE SUPPLY COMMUNITY

Action required	Term	Issue	OPR
1. Add CALS to the curriculum for formal supply schools	Short	Other	OSD/ Services
2. Deploy a lecture team to teach and demonstrate CALS concepts and benefits	Short	Other	OSD
3. Develop a network of CALS focal points within the supply community to serve as resources for field personnel	Short	Other	OSD/ Services

APPENDIX G

GLOSSARY

ADP	=	Automated data processing
AFLC	=	Air Force Logistics Command
AI	=	Artificial Intelligence
AIA	=	Aerospace Industry Association
AMC	=	Army Materiel Command
A_o	=	operational availability
ASD	=	Assistant Secretary of Defense
ASO	=	Aviation Supply Office (Navy)
AUTODIN	=	Automatic Digital Network
CAD	=	computer-aided design
CAGE	=	commercial and government entity
CALS	=	Computer-Aided Acquisition and Logistics Support
CAM	=	Computer-Aided Manufacturing
CCSS	=	Commodity Command Standard System (Modernized) (Army)
CDRL	=	Contract Data Requirements List
CE	=	concurrent engineering
CIM	=	Corporate Information Management
CITIS	=	Contractor Integrated Technical Information Service
CTOL	=	Cataloging Tools On-Line
DASD	=	Deputy Assistant Secretary of Defense
DCN	=	design change notice
DCSC	=	Defense Construction Supply Center

DDN	=	Defense Data Network
DID	=	Data Item Description
DIDS	=	Defense Integrated Data System
DLA	=	Defense Logistics Agency
DLIS	=	Defense Logistics Information System
DLSC	=	Defense Logistics Support Center
DMR	=	Defense Management Review
DRAMA	=	Data Review, Analysis, and Monitoring Aid
DSREDS	=	Digital Storage and Retrieval Engineering Data System (Army)
DSS	=	Decision Support System
DoD	=	Department of Defense
ECP	=	engineering change proposal
EDCARS	=	Engineering Data Computer Assisted Retrieval System (Air Force)
EDI	=	Electronic Data Interchange
EDMICS	=	Engineering Drawing Management Information Control System
ES	=	equipment specialist
FEDLOG	=	Federal Logistics Data on Compact Disk
FIIG	=	*Federal Item Identification Guide*
FLDS	=	Federal Logistics Data Service
FYDP	=	five year defense plan
FMECA	=	failure modes, effects and criticality analysis
FSC	=	Federal Supply Class
FSD	=	full scale development
GAO	=	General Accounting Office
GBL	=	Government Bill of Lading

GFB	=	Government-Furnished Baseline
GIRDER	=	Government/Industry Reference Data Edit and Review Program
I&S	=	Interchangeability and Substitutability
ICAPS	=	Interactive Computer Aided Provisioning System (Navy)
ICP	=	Inventory Control Point
ICS	=	Interim Contractor Support
IEC	=	item entry control
IM	=	item manager
IMC	=	inventory management code
IMM	=	Integrated Material Manager
IOC	=	initial operational capability
IPMIS	=	Initial Provisioning Management Information System
IWSDB	=	Integrated Weapon System Data Base
JLSC	=	Joint Logistics Systems Center
LCIM	=	Logistics Corporate Information Management
LLTI	=	Long Lead Time Item
LMI	=	Logistics Management Institute
LOGPARS	=	Logistics Planning and Requirements System (Army)
LLI	=	Long Lead Item
LOGRUN	=	Logistics Remote User Network
LORA	=	level of repair analysis
LSA	=	Logistics Support Analysis
LSAR	=	Logistics Support Analysis Record
LSMIS	=	Logistics Support Management Information System (Air Force)
MARS	=	Materiel Readiness Support System (DLA)
MEDALS	=	Military Engineering Data Asset Locator System

MMB	=	Materiel Management Board
MODELS	=	Modernization of the Defense Logistics System
MPCAG	=	Military Parts Control Action Group
MPCASS	=	Modernized Parts Control Automated Support System (DLA)
MRP	=	material requirements planning
MRR	=	maintenance replacement rates
MSD	=	material support date
MTBF	=	mean time between failure
MTD	=	maintenance task distribution
NAIS	=	Navy Automated Indexing System
NDI	=	nondevelopmental Item
NLN	=	Navy Logistics Network
NSN	=	national stock number
OASD(P&L)	=	Office of the Assistant Secretary of Defense (Production and Logistics)
OPR	=	office of primary responsibility
OPTEMPO	=	Operational Tempo
O&S	=	Order and Shipping
OSD	=	Office of the Secretary of Defense
PDES	=	Product Data Exchange using STEP
PIO	=	provisioning item order
PLISN	=	provisioning line item serial number
PLT	=	Procurement Lead Time
PM	=	Program manager
POM	=	Program Objection Memorandum
PPL	=	provisioning parts list
PPSL	=	Program Parts Selection List

PTD	=	provisioning technical documentation
QPL	=	Qualified Production List
RAM	=	reliability, availability and maintainability
RAMP	=	Rapid Access to Manufacturing Parts
RDB	=	Requirements Data Bank
RFP	=	request for proposals
RNCC	=	reference number category code
RNVC	=	reference number variation code
RPDMRC	=	reference or partial descriptive method reason code
SAILSS	=	Seawolf Integrated Logistics Support System
SAIP	=	Spares Acquisition Integrated with Production
SAMMS	=	Standard Automated Material Management Systems (Modernized)
SMISC	=	Supply Management Improvement Steering Committee
SMR	=	source, maintenance, and recoverability (code)
SPCC	=	Ships Parts Control Center (Navy)
SPS	=	Ships' Provisioning System (Navy)
SPTD	=	supplemental provisioning technical documentation
SSN	=	Nuclear Fast Attack Submarine
SSR	=	supply support request
STEP	=	Standard for the Exchange of Product Model Data
TD/CMS	=	Technical Data/Configuration Management System (Modernized) (Army)
TDP	=	technical data package
TIIF	=	Technical Information Index File (DLA)
TIR	=	total item record (DLA)
TM	=	technical manual

UADPS/ICP	=	Uniform Automated Data Procedures/Inventory Control Points (Navy)
WBS	=	work breakdown structure
WSF	=	Weapon Systems File (Navy)
WSMIS	=	Weapon System Management Information System (Air Force)
WSSP	=	Weapon System Support Program (DLA)